

## Chapter 15

Short Questions:

### 1. What is lithotripsy? (LB-2018)

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. 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.

### 2. What are pyrogens? (LB-2008, 2013, 2021)

In bacterial and viral infections mainly, leukocytes increase in number. These pathogens and the blood cells produce chemicals called as pyrogens. Pyrogens displace the set point of hypothalamus above the normal point of 37° C. Fever or high temperature helps in stimulating the protective mechanisms against the pathogens

### 3. What is hypertonic environment and what changes occur in a cell in such environment? (OR)

**Differentiate between hypotonic and hypertonic environment. (LB-2010, 2012, 2016)**

Hypertonic environment	Hypotonic environment
<ul style="list-style-type: none"><li>● The more concentrated external environment as compared to internal environment.</li><li>● It has more salt concentration</li><li>● The hypertonic environment renders cell solutions concentrated and shrinks the cell due to loss of water.</li></ul>	<ul style="list-style-type: none"><li>● Diluted solution compared to the cell concentration</li><li>● It has more water concentration.</li><li>● Hypotonic environment osmotically causes entry of water into the cell and renders the cell solutions diluted. The cell becomes turgid.</li></ul>

### 3. What are osmoconformers and osmoregulators? (LB-2011)

Osmoconformers	Osmoregulators
<ul style="list-style-type: none"><li>● Animal body fluids are kept isotonic to the external environment even for marine saltwater environment.</li><li>● These animals thus do not require actively to adjust their internal osmotic state, so are known as osmoconformers.</li></ul>	<ul style="list-style-type: none"><li>● The animals whose body fluid concentrations differ noticeably the outside environment.</li><li>● They actively regulate by discharging excess water in hypotonic and excreting salts in hypertonic conditions therefore, are called</li></ul>

	as osmoregulators.
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#### 4. What is extracorporeal shock wave lithotripsy? (LB-2014)

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. 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.

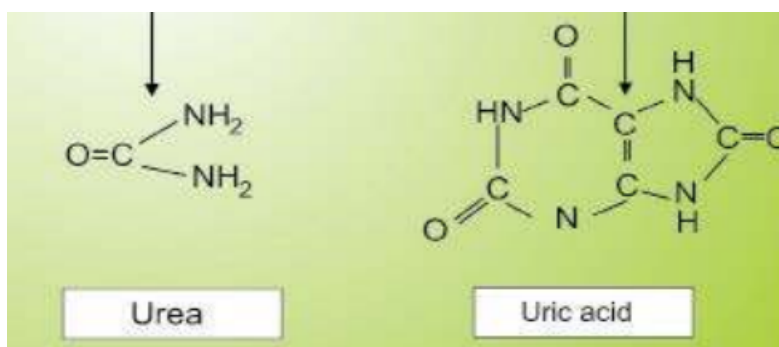
#### 5. What are heat shock proteins? (LB-2016)

The cells of some plants synthesize large quantities of special proteins called heat-shock proteins. These proteins embrace enzymes and other proteins thus help to prevent denaturation.

#### 6- What are flame cells? Give their role. (OR) What are flame cells? Why they are called so? (LB-2014)

Planaria the animals of the group of flatworms have simple tubular excretory system called protonephridium. A protonephridium is a network of closed tubules without internal openings. Tubular system 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 (The beating of cilia looks like a flickering flame, therefore these cells are termed flame cells). The tubular system is drained into excretory ducts, which open to the exterior through several nephridiopores

#### 8. Write structural formula of urea and uric acid. (LB-2010, 2012)



**9. Define homeostasis. Give its importance. (LB-2011, 2013)**

Definition: The protection of internal environment from the harms of fluctuations in external environment is termed as homeostasis.

Importance:

The homeostasis keeps the internal fluctuations in a narrow range with various control systems compared to wider external fluctuations. Most susceptible components of internal environment that may be affected by fluctuations in external environments are water, solutes and temperature. Also the mechanism an organism has adapted to eliminate harmful nitrogenous wastes depends upon the availability of water.

**10. Define anhydrobiosis with an example. (LB-2012, 2014, 2018)**

Terrestrial animals can tolerate dehydration and it differs in various animals. This characteristic is known as anhydrobiosis.

**10. Define counter current multiplier mechanism. (LB-2018, 2019)**

The interstitial fluid of the kidney is gradually concentrated from cortical to medullary part, thus inner medulla is highly concentrated with the presence of urea and through a mechanism of countercurrent multiplier. This mechanism causes gradual osmotic outflow of water from the filtrate back to kidney as it passes downward in the descending loop of Henle. Furthermore, ascending loop of Henle does not allow outflow of water from its filtrate, instead actively transport Na ions into kidney interstitium to sustain its high concentration.

**11. Differentiate between poikilotherms and homeotherms. (LB-2012, 2013)**

Poikilotherms	Homeotherms
<ul style="list-style-type: none"><li>● There are animals in which body temperature tends to fluctuate more or less with ambient temperature where air or water temperatures are changed, these are poikilotherms,</li><li>● All invertebrates, fish, amphibians and reptiles are considered in this category.</li></ul>	<ul style="list-style-type: none"><li>● Animals when exposed to changing air or water temperature maintain their body temperature are the homeotherms and</li><li>● These include birds and mammals.</li></ul>

**12. Differentiate between ectotherms and endotherms. (LB-2009, 2014)**

Ectotherms	Endotherms
<ul style="list-style-type: none"> <li>● Ectotherm is the other type, which produce metabolic heat at low level and that is also exchanged quickly with the environment, however, absorb heat from their surroundings.</li> <li>● Most invertebrates, fish, amphibians and reptiles are in this category</li> </ul>	<ul style="list-style-type: none"> <li>● Endotherms are animals that generate their own body heat through heat production as by-product during metabolism are endotherms.</li> <li>● They include lying insects, some fishes, birds and mammals</li> </ul>

**13. Differentiate between shivering and non-shivering thermogenesis. (LHR 2020)**

Shivering thermogenesis	Non-Shivering thermogenesis
<ul style="list-style-type: none"> <li>● The rate of heat production is increased by increased muscle contraction by movements or shivering so called as shivering thermogenesis.</li> </ul>	<ul style="list-style-type: none"> <li>● Hormones trigger the heat production as do thyroid hormones and are termed as non-shivering Thermogenesis.</li> </ul>

**15- Differentiate between hemodialysis and peritoneal dialysis. (LB-2018)**

Hemodialysis	Peritoneal dialysis
<ul style="list-style-type: none"> <li>● Hemodialysis means 'cleaning the blood'. In this procedure blood is circulated through a machine which contains a dialyzer also called an artificial kidney.</li> <li>● Dialyzer has two spaces separated by thin membrane. Blood passes from one side of the membrane and dialysis fluid on the other.</li> <li>● The wastes and excess water pass from the blood through the membrane into the dialysis fluid.</li> </ul>	<ul style="list-style-type: none"> <li>● Peritoneal dialysis work on the same principle except that abdomen has a peritoneal cavity, lined by a thin epithelium called peritoneum.</li> <li>● Peritoneal cavity is filled with dialysis fluid that enters the body through a catheter.</li> <li>● Excess water and wastes pass through the peritoneum into the dialysis fluid</li> </ul>

**16- Differentiate between xerophytes and mesophytes. (OR) What are xerophytes? Give two adaptations of xerophytes. (LB-2012)**

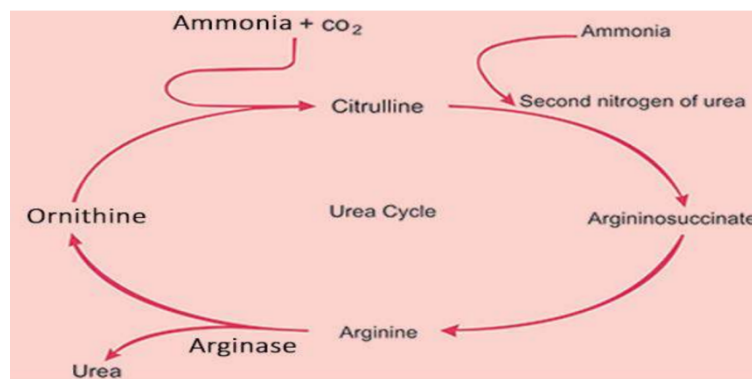
**Mesophytes:**

- Have moderate water availability.
- In sufficient supply of water stomata are kept open to promote loss of excess water, however, in restricted supply stomata close to prevent the loss
- Example: Brassica, rose, mango etc.

**Xerophytes:**

- Have the adaptations for reduced rate of transpiration.
- Many xerophytes possess small, thick leaves to limit water loss by reducing surface area proportional to the volume.
- Their cuticle is thick, waxy and leathery.
- Stomata are on lower surface of leaves and located in depression.
- Some as cacti, during the driest season, shed their leaves to restrict transpiration completely, thus stems are the photosynthetic organs.
- In rainy season, stem stores water for use in dry conditions

**17. Draw and label urea cycle. (LB-2018)**



**18. Explain the process of panting with example. (LHR 2019)**

Panting, the evaporative cooling in the respiratory tract. This is the mechanism as represented in the dogs. Bats etc use saliva and urine for evaporative cooling

**19- Illustrate the function of Malpighian tubules. (LB-2010)**

Terrestrial arthropods particularly in the insects, the excretory structures are adapted to collect excretory products from hemolymph in sinuses through suspended tubular structures called

Malpighian tubules. These Malpighian tubules remove nitrogenous waste from the hemolymph. These are the only excretory structures in animal kingdom that are associated with digestive tract.

**20- Why leaves are said to be excretophore? (LB-2011, 2019)**

leaves are destined to fall of, as is the case of autumn leaves in plants or die of as happens in the leaves and stalk of certain bulbs e.g. bluebell, leaving the bulb underground. This is the reason gardener ind rotted autumn leaves a good source of minerals.

The falling of yellow leaves in autumn is thseasonal time for the plants to get rid of the accumulated wastes and because of the reason leaves are said to be excretophore. According to an explanation the change in color in these leaves is not due to removal of chlorophyll as the microscopic examination of autumn leaves shows that leaves are loaded with pigmented compounds prior to falling of and many toxic materials like heavy metals increase sharply as the yellowing proceeds.

**21. Differentiate between protonephridium and metanephridium. (LHR 2019)**

Protonephridium	Metanephridium
<ul style="list-style-type: none"> <li>● A protonephridium is a network of closed tubules without internal openings.</li> <li>● Tubular system is spread throughout the body and branches are capped by a cellular setup termed as flame cell.</li> <li>● Each lame cell has a tuft of cilia, whose beating propels interstitial fluid into the tubular system (The beating of cilia looks like a flickering lame, therefore these cells are termed flame cells).</li> <li>● The tubular system is drained into excretory ducts, which open to the exterior through several nephridiopores</li> </ul>	<ul style="list-style-type: none"> <li>● Another type of tubular excretory system called as metanephridium.</li> <li>● Each segment of earthworm has a pair of metanephridia. This system has an internal ciliated opening the nephrostome immersed in coelomic fluid and enveloped by a network of capillaries.</li> <li>● Nephrostome collects coelomic fluid. As fluid moves along the tubule, epithelium reabsorbs salt from the lumen and sends to blood vessels surrounding the nephridium.</li> <li>● The left over appears as urine containing nitrogenous waste</li> </ul>

**22. Define uremia. What is permanent treatment? (LHR 2021)**

In high degree renal failure also called as uremia or end-stage renal disease, the dialysis can not be done hence thus the surgical transplantation of a matching donor kidney is the only option left for as the permanent treatment.

Short Questions:

**1. What is sciatica? (OR) What is sciatica and its causes? (LB-2009, 2010, 2016)**

It is characterized by stabbing pain radiating over the course of sciatic nerve. It results due to injury of proximal sciatic nerve, which might follow a fall, a herniated disc or improper administration of an injection into the buttock. This may result in a number of lower limb impairment depending on the precise nerve root injured. When sciatic nerve is completely transected, the legs become nearly useless. They cannot be flexed and all foot-ankle movement is lost. Recovery from sciatic injury is usually slow and incomplete.

**2. What is foreman triosseum? (OR) What is foreman triosseum? How it is formed? (LB-2010, 2015)**

The lifting action of birds is possible because the tendon of the supra- coracoid muscles passes through an opening the foramen triosseum formed between the scapula coracoid and clavicle bones and is attached to the upper surface of the humerus.

**3. What is the role of vascular cambium? (LB-2011, 2012)**

Secondary growth occurs due to cell division in : (i) Vascular cambium (ii) Cork cambium. Vascular cambium first appears as a cylinder of actively dividing cells between primary xylem and primary phloem. Vascular cambium gives rise to two new tissues, one is the secondary xylem next to the inner surface of the vascular cambium, the other is the secondary phloem appearing outer to the vascular cambium.

**4. What is axial skeleton? (LB-2012)**

The axial skeleton includes the skull, the vertebrae, ribs and the sternum.

**Skull:** It is made up of cranium and facial bones. The cranium consists of 8 bones (Fig 16.4), 4 unpaired and 2 paired which protect the brain. there are 14 facial bones of which 6 are paired and 2 unpaired.

**Vertebral column:** Extends from the skull to the pelvis to form backbone, which protects the spinal cord. Normally the vertebral column has 4 curvatures, which provide more strength than does the straight column. The vertebral column consists of 33 vertebrae.

**Rib cage :** It is composed of twelve pairs of ribs that articulate with the thoracic vertebrae. Ten of them connect anteriorly with sternum, either directly or through the costal arch. The lower two pairs of ribs are called "floating ribs" because they do not attach to the sternum

**5. What are synovial joints? (LB-2014)**

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.

Based on structure and movements allowed, the synovial joints can be classified further into two major categories:

- Hing joints
- Ball and socket joints

**5. What is meant by passive and active flight? (OR) Differentiate between active and passive flight. (LB-2012, 2013)**

Active flight	Passive flight
<ul style="list-style-type: none"><li>● When little or no support can be gained from upward air currents, the same effect can be achieved by lapping the wings.</li><li>● As the birds moves through the air, the air lows more quickly over the curved upper surface than over the lower surface.</li><li>● This reduces the air pressure on the top of the wing, compared with air pressure below the wing. There is, therefore, a net upward pressure on the wing which gives lift to the bird.</li></ul>	<ul style="list-style-type: none"><li>● When birds glide, the wings act as aerofoils. An aerofoils is any smooth surface which moves through the air at an angle, to the airstream.</li><li>● The air lows over the wing in such a way that the bird is given lift; the amount of lift depends on the angle at which the wing is held relative to the airstream.</li></ul>

**6. What is rickets? Give its causes and cure. (OR) How is rickets produced? (LB-2012)**

Rickets is another disease in children with bowed legs and deformed pelvis. It is caused by deficiency of calcium in diet or vitamin ‘D’ deficiency. It is treated by vitamin ‘D’ fortified milk and exposing skin to sunlight.

**7. What is herniation of discs? (OR) Define disc-slip. (OR) What are the causes of herniation of discs?(LB-2010, 2011, 2013)**

Each intervertebral disc is a cushion - like pad composed of an inner semi fluid nucleus pulposus which acts as rubber ball to give a disc its elasticity and compressibility and a strong outer ring of fibrocartilage, the annulus fibrosus. The annulus fibrosus holds together successive vertebrae.



The discs act as shock absorber during walking, jumping, running and to lesser extent bend laterally. Severe or sudden physical trauma to spines for example from bending forward while lifting a heavy object may result in herniation of one or more discs. The herniated disc (commonly known slipped disc) usually involves rupture of annulus fibrosus followed by protrusion of the spongy nucleus pulposus. If protrusion presses on spinal cord or on spinal nerves exiting from spinal cord, generate severe pain or even destruction of these nervous structure. Disc slip is treated with bed rest, traction and painkiller. If this fails disc may be removed surgically.

**8. What is the difference between tetanus and muscle tetany? (LB-2018)**

Tetany	Tetanus
<ul style="list-style-type: none"> <li>● Tetany is the disease caused by low calcium in the blood.</li> <li>● It increases the excitability of neurons and results in loss of sensations.</li> <li>● Muscle twitches and convulsion occur. If untreated the system progresses to spasm of larynx, respiratory paralysis and ultimately death occurs.</li> </ul>	<ul style="list-style-type: none"> <li>● The term tetanus is used for an acute infectious disease caused by anaerobic bacterium <b>Clostridium tetani</b> resulting in persistent painful spasms of some skeletal muscles.</li> <li>● Typically begins gradually with stiffness of jaws and neck muscles and progresses to fixed rigidity of jaws (lock jaw) and spasms of trunk and limb muscles, usually fatal due to respiratory failure</li> </ul>

**9. What are the sources of energy for muscle contraction? (LB-2012)**

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 (prolonged or strenuous muscular activity), ATP requirement is met by anaerobic breakdown of glucose into

Lactic acid. Lactic acid accumulation causes muscle fatigue. At rest, 1/5 of the lactic acid is broken aerobically and its energy is used to change the remaining 4/5 lactic acid into glucose.

**10. What is the difference between exoskeleton and endoskeleton? (OR) What is the composition of exoskeleton? (LB-2015)**

An exoskeleton is hardened outer covering to which internal muscles are attached. The exoskeleton is inert and non-living. It is secreted by the ectoderm in animal cells.

It is composed of two layers.

The epicuticle is the outer most layer. Because it is made up of waxy lipoprotein, it is impermeable to water and serves as a barrier to microorganisms in insects. The bulk of exoskeleton is below the epicuticle and is called the procuticle.

Procuticle consists of an outerlayer exocuticle and inner layer of endocuticle. The procuticle is composed of chitin, tough, leathery, polysaccharide and several kinds of protein. It is further hardened by sclerotization and sometimes by impregnation with calcium carbonate.

**11. What is the hematoma formation? (LB-2016)**

Hematoma Formation : When a bone breaks, the blood vessels in the bone itself, and perhaps in surrounding are torn resulting in 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.

**12. What is effective and recovery stroke? (OR) Differentiate between effective and recovery stroke. (LB-2016)**

Effective stroke	Recovery stroke
five out of nine (5/9) double fibrils contract or slide simultaneously with the result that cilium bend or shorten	The four out of nine(4/9) double fibrils contract and cilium becomes, straight. It is called recovery stroke.

**14. What are plantigrade and unguligrade? (OR) What are plantigrade, digitigrade and unguligrade mammals? (LB-2017)**

1. Plantigrade : In this mode of locomotion the mammals walk on their soles with palm, wrist, and digits all resting more or less on ground, such as monkeys, apes, man and bear etc.

2. Digitigrade : Some mammals tend to walk on their digits only. They run faster than plantigrade animals. In these mammals, first digit usually reduces or completely lost as in rabbit, rodents etc.

3. Unguligrade : These mammals walk on the tips of toes modified into hoof as deer, goat. It is the most swift type of locomotion.

**15. Characterize collenchyma cells. (LB-2011, 2012)**

Collenchyma cells have protoplasts and usually lack secondary walls. They have angular thickening in their primary walls. They are usually grouped in strands or cylinders. Collenchyma cells provide support to young herbaceous parts of the plant. Young stems, for instance, often have a cylinder of collenchyma just below their surface. Collenchyma cells are elastic, elongate with the growth of stems and leaves.

**16. Compare phototropism and geotropism. (LB-2017)**

Phototropism	Geotropism
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,	Geotropism : It is the response to gravity. Roots display positive geotropism and shoots negative geotropism.

**17. Compare hinge joint with ball and socket joint. (LB-2012, 2018)**

Hing Joints	Ball and Socket joints
The joint that allows the movements in two directions. These are at elbow and knee. At these joints, pair of muscles are arranged in the same plane as that of joints. One end of each muscle, the origin is fixed to the immovable bone on one side of joint and the other end of muscles, the insertion is attached to the far side of the joint.	The joint that allows the movement in several directions. Such joints have at least two pairs of muscles present perpendicular to each other. They provide maximum flexibility. Hip joint and shoulder joint are the examples of ball and socket joints.

**18. Discuss hematoma formation. (LB-2010)**

Hematoma Formation : When a bone breaks, the blood vessels in the bone itself, and perhaps in surrounding are torn resulting in 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.

**19. Define photonasty and thermonasty. (LB-2016)**

**Photonasty** : The principal stimulus is the photoperiod. The flowers open and close due to light intensity.

**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.

**20. Define haptanastic movement. (LB-2014)**

Haptanastic movements occur in response to contact. Examples include the action of the Venus fly trap.

**21. Define antagonistic movement of muscles. (LB-2018)**

At joint, these muscles work against each other by contraction. This relationship is called antagonism. The best example is the movement of elbow joint by biceps and triceps. The biceps bends the arm at the elbow joint, and triceps straightens it.

The biceps brachii muscle arises by the two heads from scapula and is inserted into the medial surface of the radius bone. The other two muscles lie below the biceps brachii. The two muscles are brachialis and brachioradialis.

The brachialis is inserted in the ulna, while brachioradialis is inserted in the radius. When these muscles contract they lift radius and ulna and bend the arm at the elbow. When triceps contracts it straightens arm at elbow.

In the antagonistic pairs one muscle reverses the effect of the other and they do not contract simultaneously.

**22. Define ecdysis. (OR) What is the process of ecdysis (moulting). (LB-2012)**

The animal needs to shed its exoskeleton periodically and replace it with one of the larger size. This process is known as "ecdysis or moulting."

Ecdysis is divided into four stages:

1. Enzymes, secreted from hypodermal glands, begin digesting the old endocuticle. This digestion separates hypodermis and the exoskeleton.
2. The old exoskeleton is split and pores are formed.
3. The digestion of endocuticle is followed by secretion of new procuticle and epicuticle.
4. Finally, the new exoskeleton is hardened by deposition of calcium carbonate. During the

hardening process, the arthropod is vulnerable to predators and remains hidden. All these changes are controlled by the nervous system and the hormone ecdysone.

**23. Discuss two main types of cartilage. (LB-2013)**

- (i) Hyaline Cartilage : It is the most abundant type in human body. It is found at the movable joints.
- (ii) Elastic Cartilage: It has matrix containing bundles of collagen fibers. It forms external pinnae of ears and the epiglottis.

**24. Differentiate between sclerenchyma and collenchyma cells. (LB-2013, 2019)**

Sclerenchyma Cells	Collenchyma cells
<ul style="list-style-type: none"> <li>● They have thick secondary cell walls usually impregnated with lignin, an organic substance that makes the walls tough and hard. Most of the sclerenchyma cells are non-living.</li> <li>● Their primary function is to provide support to the plant parts.</li> <li>● There are three types of sclerenchymatous cells.</li> <li>● (i) Fibers (Tracheids): These are long and cylindrical and they may exist as solid bundles in xylem or as bundle caps.</li> <li>● (ii) Sclereides: These are shorter than fibers and are found in seed coats and nut shells and provide protection.</li> <li>● (iii) Vessels (Tracheae): Long tubular structures, join end to end to form long water conducting pipe in xylem.</li> </ul>	<ul style="list-style-type: none"> <li>● Collenchyma cells have protoplasts and usually lack secondary walls.</li> <li>● They have angular thickening in their primary walls.</li> <li>● They are usually grouped in strands or cylinders.</li> <li>● Collenchyma cells provide support to young herbaceous parts of the plant.</li> <li>● Young stems, for instance, often have a cylinder of collenchyma just below their surface.</li> <li>● Collenchyma cells are elastic, elongate with the growth of stems and leaves.</li> </ul>

**25. Differentiate between fibers and sclereids. (LB-2014)**

Fibers (Tracheids)	Sclereides:
These are long and cylindrical and they may exist as solid bundles in xylem or as bundle caps.	These are shorter than fibers and are found in seed coats and nut shells and provide protection.

**26. Differentiate between compact bone and spongy bone. Give only two differences. (LB-2018)**

- Compact bone is dense and strong and provides an attachment site for a muscle.
- Spongy bone is light, rich in blood vessels, and highly porous. The cavities of spongy bone contain bone marrow where blood cells are formed.

**27. Distinguish between axial skeleton and appendicular skeleton. (LB-2008, 2014)**

**Axial Skeleton**

The axial skeleton includes the skull, the vertebrae, ribs and the sternum.

**Skull:** It is made up of cranium and facial bones. The cranium consists of 8 bones (Fig 16.4), 4 unpaired and 2 paired which protect the brain. Parietal and temporal are paired bones, whereas frontal, occipital, sphenoid and ethmoid are unpaired bones. Besides that there are 14 facial bones of which 6 are paired and 2 unpaired.

**Vertebral Column :** Vertebral column extends from the skull to the pelvis to form backbone,

**Rib cage :** It is composed of twelve pairs of ribs that articulate with the thoracic vertebrae. It protects the spinal cord.

**Appendicular Skeleton**

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

**Pectoral Girdle and Fore Limb :** Pectoral girdle comprises scapula, suprascapula, and clavicle.

The clavicle connects scapula with sternum.

**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.

**28. Differentiate between skeletal and smooth muscles. (LB-2012)**

Smooth Muscles	Skeletal Muscles
<ul style="list-style-type: none"> <li>● Smooth muscles were the earliest form of muscle to evolve and it is found throughout animal kingdom.</li> <li>● Smooth muscles are long and spindle shape with each containing a single nucleus.</li> <li>● It has no striations. It is not under the voluntary control.</li> </ul>	<ul style="list-style-type: none"> <li>● The muscles that are attached to the skeleton and are associated with the movement of bones are called skeletal muscles.</li> <li>● The skeletal muscles are consciously controlled and therefore, are called voluntary muscles.</li> </ul>

<ul style="list-style-type: none"> <li>● We describe smooth muscle tissue most precisely as visceral, non-striated and involuntary.</li> <li>● These muscles are found in the blood vessels, digestive tract and many other organs</li> </ul>	<ul style="list-style-type: none"> <li>● Skeletal muscles are also called striped or striated muscles because they show alternate light and dark bands, e.g., triceps and biceps.</li> <li>● Generally, each end of the entire muscle is attached to bone by a bundle of collagen, non-elastic fibres, known as tendons.</li> </ul>
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**29. Differentiate between Osteoporosis and Osteomalacia. (LB-2016)**

<b>Osteoporosis</b>	<b>Osteomalacia (soft bones)</b>
<ul style="list-style-type: none"> <li>● Osteoporosis is a group of diseases in which bone resorption outpaces bone deposit.</li> <li>● In this case bone mass is reduced and chemical composition of the matrix remains normal.</li> <li>● Osteoporosis mostly occurs in aged women, which is related to decreased estrogen level.</li> <li>● Other factors which may contribute include, insufficient exercise, diet poor in calcium and protein, smoking, etc.</li> <li>● Estrogen replacement therapy (ERT) offers the best protection against osteoporotic bone fractures.</li> </ul>	<ul style="list-style-type: none"> <li>● Osteomalacia (soft bones) includes a number of disorders in which the bones receive inadequate minerals.</li> <li>● In this disease, calcium salts are not deposited and hence bones soften and weaken.</li> <li>● Weight bearing bones of legs and pelvis bend and deform.</li> <li>● The main symptom is the pain when weight is put on affected bones.</li> </ul>

**30. Distinguish between the phototactic and chemotactic movements. (OR) What is phototactic movement? (OR) What is chemotactic movement? (LB-2015, 2019)**

<b>Phototactic movement</b>	<b>Chemotactic movement</b>
<ul style="list-style-type: none"> <li>● It is a movement in response to stimulus of light. The movement may be towards the source of light (positive) or away from the source of light (negative).</li> <li>● The best example of positive tactic movement is the passive movement of chloroplast due to cyclosis.</li> <li>● This movement helps the chloroplast to absorb maximum light for CO<sub>2</sub> fixation.</li> </ul>	<ul style="list-style-type: none"> <li>● The movement in response to stimulus of chemicals is called chemotactic movement.</li> <li>● The movements shown by sperms of liver-worts, mosses, ferns towards archegonia in response to stimulus of nucleic acid released by the ovum is one such example.</li> </ul>

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| <ul style="list-style-type: none"><li>● The light intensity and direction both affect the intra cellular distribution of chloroplasts</li></ul> |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------|--|

**31. Differentiate between brachialis and brachioradialis. (LHR 2018)**

The biceps brachii muscle arises by the two heads from scapula and is inserted into the medial surface of the radius bone. The other two muscles lie below the biceps brachii. The two muscles are brachialis and brachioradialis. The brachialis is inserted in the ulna, while brachioradialis is inserted in the radius.

**32. Differentiate between origin and insertion of muscle. (LHR 2018)**

- Origin is the end of muscle which remains fixed when muscle contracts.
- Insertion is the end of the muscle that moves the bone.

**33. Differentiate between bone and cartilage. (LHR 2018,2019)**

**Bone** : It is the most rigid form of connective tissue. The collagen fibers of bone are hardened by deposit of calcium phosphate. Bones supporting your arms and legs consist of an outer shell of compact bone, with spongy bone in the interior. Compact bone is dense and strong and provides an attachment site for a muscle. Spongy bone is light, rich in blood vessels, and highly porous. The cavities of spongy bone contain bone marrow where blood cells are formed. There are three types of cells associated with bone:

Bone-forming cell (osteoblast ), mature bone cell (osteocyte ), and bone dissolving cells (osteoclast)

**Cartilage** : It is much softer than bone. It is a form of connective tissue. It covers ends of the bone at the joint, and also supports the flexible portion of nose and external ears. The living cells of cartilage are called chondrocytes. These cells secrete flexible, elastic, non-living matrix collagen that surrounds the chondrocytes. No blood vessels penetrate into this cartilage. There are three main types of cartilage.

(i) Hyaline Cartilage:

(ii) Elastic Cartilage:

(iii) FibroCartilage:

**34. Differentiate between troponin and tropomyosin.**

Twisting around the actin chains are two strands of another protein, **tropomyosin**.



The other major protein in thin filament is **troponin**. It is actually **three polypeptide complex**, one binds to **actin**, another binds to **tropomyosin** while third binds **calcium ions**.

**35. Differentiate between heartwood and sapwood. LHR (2019)**

When Tree grows older only few annual growth rings are active in conduction at one time. The active portion is called sap wood. The inactive nonconducting wood is called heartwood.

In most species, the heartwood accumulates a variety of chemicals such as resins, oils, gums and tannins. These provide a resistance to decay and insect attack, for example, in red cedar and Conifers

**36. Differentiate between vessel and tracheids. (LHR 2019)**

(i) Fibers (Tracheids): These are long and cylindrical and they may exist as solid bundles in xylem or as bundle caps.

(iii) Vessels (Tracheae): Long tubular structures, join end to end to form long water conducting pipe in xylem.

**37. Differentiate between ligament and tendon. (LB-2018)**

Ligaments	Tendons
Ligaments attach bone to bone and are slightly elastic.	Tendons attach muscles to bones and are non-elastic.

**38. Explain two types of nastic movements. (OR) Compare epinasty and hyponasty. (LB-2012, 2013, 2016)**

● **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 flower side by upward and inward bending of the petals.

**(ii) Haptonastic movements** occur in response to contact.

● (a) Epinasty: It is shown by leaves, petals etc. The upper surface of leaf in bud condition shows

more growth as compared with the lower surface. This leads to opening of buds.

- (b) Hyponasty: If growth in the lower surface of the leaf in bud condition is more than that of the upper surface then the bud will remain closed

Examples include the action of the Venus fly trap.

### **39. Enlist some of the functions of skeleton. (LB-2015)**

**(i) Support and shape :** Bones support soft tissues and serve as attachment sites for most muscles and provide shape to the body.

**(ii) Protection:** Bones protect critical internal organs, such as brain, spinal cord, heart and lungs.

**(iii) Movement:** Skeletal muscles attached to the bones help in moving the body.

**(iv) Mineral homeostasis:** Bones serve as store for calcium, phosphorus, sodium and potassium. Through negative feedback mechanisms, bones can release or take up minerals to maintain homeostasis.

**(v) Blood cell production:** Red and white blood cells are produced in bone marrow, a connective tissue found within certain bones.

### **40. How callus is formed? (LB-2012)**

An important function of the cambium is to form callus or wood tissue on or over the wound, soft parenchymatous tissues are rapidly formed on or below the damaged surface of stems and roots. Callus also unites the branches during budding and grafting.

### **41. Name the different types of cells associated with bones. (LB-2014)**

- Bone-forming cell (osteoblast )
- Mature bone cell (osteocyte )
- Bone dissolving cells (osteoclast)

### **42. Define sleep movement in plants with example. (LHR 2018)**

#### **Sleep movements:**

Bean plants and some members of legume family lower their leaves in the evening and raise them in the morning. These are known as sleep movements. These sleeping movements are due to daily changes in turgor pressure in the pulvinus. The place of attachment of leaf with the shoot, pulvinus, is swollen portion of the petiole composed of parenchymatous cells with relatively large inter cellular spaces and central strand of vascular tissues.

When turgor pressure on the lower side of pulvinus increases the leaves rise and become horizontal. When turgor pressure decreases on the lower side of pulvinus, the leaves lower and go to “sleeping” Position.

## Chapter 17

### Short Questions

#### 1. What is innate behavior? (LB-2016)

It is a collection of responses that are predetermined by the inheritance of specific nerve or cytoplasmic pathways in multicellular or unicellular (acellular) organisms. As a result of the built in pathways, a given stimulus would invariably produce the same response.

##### Examples

All plant behavior is innate.

#### 2. What is the role of hypothalamus? (LB-2016)

It is a part of the forebrain. It is here that many of the sensory stimuli of nervous system are converted into hormonal responses.

#### 3. What is synapse? (LB-2011)

Consecutive neurons are so arranged that the axon endings of one neuron are connected to the dendrites of the next neuron. There is no cytoplasmic connection between the two neurons and microscopic gaps are left between them. Each of these contact points is known as synapse.

#### 4. What is habituation? Give an example. (LB-2013)

Habituation is the simplest form of learning and involves modification of behavior through a diminution of response to repeated stimuli. A loss of receptivity to repetitious stimuli can be useful in preventing a drain of energy and attention for trivial purposes.

##### For example:

(i) A snail crawling on a sheet of glass retracts into its shell when glass is tapped. After a pause, it emerges and continues moving. A second tap causes retraction again but it emerges more quickly. Ultimately, tapping has no effect and snail ceases to respond.

ii) Rodents respond to alarm calls by others in their group, if these calls are continued and no danger is confirmed, further calls may be ignored

#### 5. What is the role of thyroxine?

- Thyroxine acts on the basal metabolic rate by stimulating the breakdown of glucose and release of heat and generation of ATP.
- They also act in conjunction with somatotropin in bringing about growth, and act directly on brain cells causing them to differentiate.
- In amphibians, they bring about the process of metamorphosis.
- If secretion of thyroid is deficient, tadpole larva of frog does not metamorphose to develop into frog, but instead grow to a large sized tadpole.

## **6. What is the role of vasopressin/ADH and oxytocin hormone?**

### **1. Antidiuretic hormone (ADH) or Vasopressin:**

Its secretion is caused by decrease in blood pressure, blood volume, and osmotic pressure of the blood which is detected by osmoreceptors in hypothalamus. External' sensory stimuli also influence hypothalamic neurosecretory cells. Increased levels cause increased water reabsorption in distal parts of nephron. A lack of this hormone produces diabetes insipidus, characterized by production of large quantities of dilute urine and great thirst.

### **2. Oxytocin:**

Its release is stimulated by distension of cervix, decrease in progesterone level in blood, and neural stimuli during parturition and suckling. Primary action is on smooth muscle, particularly in the uterus during childbirth, and causes milk ejection from mammary glands.

## **7. What is the function of estrogen and progesterone?**

### **1. Oestrogen:**

- Oestrogen is secreted by ripening follicles (and, in many species, by interstitial cells of the ovary) whose development has been initiated by FSH from the pituitary.
- Oestrogens bring about the development of the secondary sexual characters in the female,
- causes thickening of the uterine wall and,
- at a point during the estrous or menstrual cycle, exert positive feedback which results in a sharp rise in LH output by the pituitary.
- Deficiency of the sex hormones, for one reason or another, leads in the young of failure to mature sexually and sterility in the adult.

### **2. Progesterone :**

- Produced by the ruptured follicle in response to LH from the pituitary.
- Progesterone inhibits further FSH secretion from the pituitary, thus preventing any more follicles from ripening.
- It also affects the uterus, causing further thickening and vascularization of its wall, and other areas of the female body, preparing it for maintaining the state of pregnancy.
- It suppresses ovulation. That is why it is a major constituent of birth control pill.

## **8. What is the commercial application of cytokinins? (LB-2016)**

- 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 the dormancy of some seeds.

## **9. What are androgens?**

- Androgens are cortical hormones secreted by adrenal cortex.
- They cause development of the secondary male characteristics.
- Very small amounts of androgens are secreted in both male and female by adrenal glands.

**10. What are sensory neurons? (LB-2016)**

Sensory neurons are the types of neurons that carry impulse to 'brain' or Central nervous system.

**11. What are axons and dendrites? (OR) How axons differ from dendrites. (LB-2009, 2010, 2014)**

Axon	Dendrite
The fibers which carry impulse towards cell body is called dendron,	The processes conducting impulses away from cell body are termed axons.
If it is a single fiber but if smaller fibers, they are called dendrites (singular: dendrite).	These may be more than a meter long in some neurons.

**12. What is reflex arc? (OR) Differentiate between reflex action and reflex arc. (LB-2012, 2014, 2018)**

Reflex arc is the pathway of passage of impulse during a reflex action. Reflex action is a type of involuntary action. The direction of stimulus is from receptors to sensory neuron to associative (association / relay) neuron and then through motor neuron to the effectors.

**13. What are the symptoms of Alzheimer's disease? (LB-2013)**

Alzheimer's disease was first described by Alois Alzheimer in 1907.

It is characterized by the decline in brain function. Its symptoms are like those diseases that cause dementia (memory loss). There is also a decline in brain function with age.

**14. What is the difference between CNS and PNS? (LB-2012, 2016)**

CNS	PNS
The CNS consists of brain and spinal cord.	THE PNS comprises of sensory neurons and motor neurons, which may form ganglia and the nerves. Ganglia are the concentrations of cell bodies of neurons.
It has associative neurons.	The nerves are the bundles of axons or dendrites, bounded by connective tissue. They may be sensory motor or mixed nerves depending upon the direction of impulse they conduct.

**15. What is the function of parathyroid gland or parathormone? (LB-2008, 2013, 2016)**

- These produce a hormone called parathormone. Low levels of blood  $Ca^{++}$  ions stimulate the parathyroid directly to increase parathormone production whereas high levels of  $Ca^{++}$  ions suppress its release.
- Under-activity causes a drop in blood  $Ca^{++}$  ions which in turn leads to muscular tetany.

**Over-activity** would lead to a progressive demineralization of the bones similar to rickets, as well as to the formation of massive kidney stones. Both conditions may be fatal.

**16. What is Parkinson's disease? (OR) Differentiate between Parkinson's and Epilepsy. (LB-2009, 2012, 2018)**

**Parkinson's disease** : It is a nervous disorder, characterized by involuntary tremors, diminished motor power and rigidity. The mental faculties are not affected. The disease is believed to be caused by cell death in a brain area that produces dopamine. Onset of disease is usually in 50's and 60's. The disease is slowly progressive; the patient may live for many years. The disease may result from head trauma. Effective drugs are available such as L- dopa.

**Epilepsy**: It is one of the convulsive disorders of nerves which are characterized by abrupt transient symptoms of motor, sensory, psychic, or autonomic nature, frequently associated with changes in consciousness. These changes are believed to be secondary to sudden transient alterations in brain function associated with excessive rapid electric discharges in the gray matter. The onset of epilepsy is usually before age 30. Later age onset suggests organic disease. In some patients, emotional disturbances play a significant "trigger" role.

Electroencephalography is the most important test in the study of epilepsy.

Anticonvulsant drugs are used. Alcohol aggravates epilepsy, so people suffering from epilepsy should avoid alcohol.

**17. What is neuroglia? 18. What are Nissl's granules? (OR) What are neuroglia and Nissl's granules?**

Neuroglia are cells, in higher animals, and in humans, which make up as much as half of the nervous system. Neuroglia plays a vital role in the nutrition of neurons and their protection by myelin sheath.

Nissl's granules are groups of ribosomes associated with rough E.R, and Golgi apparatus are present in the cell body.

**19. What are gastrin and secretin? (OR) Give the functions of secretin and gastrin. (OR) Name the two hormones of the gut. (LB-2010, 2013)**

**1. Gastrin**: Gastrin is the hormone produced by mucosa of the pyloric region of the stomach. It stimulates the secretion of gastric juice. It is produced under the influence of protein food in the stomach after it is partially digested.

**2. Secretin:** It is produced from the duodenum when acid food touches its lining. It affects the pancreas to produce and release pancreatic juice and also affects the rate of bile production in the liver.

**20. Write function of photoreceptors and nociceptors. (LB-2014)**

- Photoreceptors (electromagnetic receptors):  
These respond to stimuli of light, for example in eyes, rods and cones.
- Nociceptors: (Undifferentiated endings) These produce the sensation of pain, when stimulated.

**21. Compare Circadian and Circannual 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. If the biorhythms are of about 365 days, these rhythms in activity are called circannual.

**22. Define saltatory impulse. (OR) Define saltatory impulse and synapse. (LB-2001, 2011)**

In myelinated neurons the impulse jumps from node to node (node of Ranvier). This is called saltatory impulse.

Consecutive neurons are so arranged that the axon endings of one neuron are connected to the dendrites of the next neuron. There is no cytoplasmic connection between the two neurons and microscopic gaps are left between them. Each of these contact points is known as synapses.

**23. Define the term hormone, give one example? (LB-2012)**

Hormones are organic compounds of varying structural complexity. They are poured directly and are transported to blood to respective target tissues. The hormones affect the target cells. Hormones may also control some long-term changes, such as rate of growth, rate of metabolic activity and sexual maturity.

**Examples:** insulin and glucagon regulate the blood sugar level.

**24. Define feedback mechanism. (LB-2018)**

It is a type of interaction in which a controlling mechanism is itself controlled by the products of reactions it is controlling.

For proper body functions, two opposing systems are needed, if there are accelerators, there must be inhibitors. If one hormone in the body promotes or stimulates a reaction, another hormone would be checking the same. In the body, interaction is mainly maintained due to feedback mechanism.

**25. Differentiate between biorhythms and diurnal rhythms. (LB-2014)**

In living things, the behavioral 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

**26. Differentiate between etiolation and chlorosis. (OR) What is chlorosis? (LB-2018)**

If plants are grown without light, they become extremely long and fail to form chlorophyll. They are said to be etiolated. Many plants take on a yellowish hue when they fail to form sufficient chlorophyll. This condition, known as chlorosis. It usually arises from short supplies of mineral nutrients in the soil.

**27. Differentiate between calluses and galls.**

Callus	Galls
If plants are wounded, they often develop masses of amorphous material with very poor differentiation known as calluses.	Galls are growths on a plant that are induced by parasites and usually have highly organized growth e.g., the tumors induced by bacteria. They are usually less differentiated than other types of galls.

**28. Differentiate between sympathetic and parasympathetic nervous system.**

Sympathetic system.	Parasympathetic system
Most ganglion fibers of the sympathetic system arise from the middle portion of the spinal cord and almost terminate in ganglia that lie near the cord.	A few cranial nerves including the vagus nerve together with the nerves from the bottom portion of spinal cord, form the parasympathetic nervous system.
This system is important during emergency situations and is associated with "fight or flight." This system accelerates the heartbeat, dilates the pupil and inhibits the digestion of food etc.	It promotes all the internal responses which are associated with the relaxed state i.e., contraction of the pupils, promotes digestion of food, retards heartbeat etc.

**29. Differentiate between active and resting membrane potential. (LB-2018)**

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.

**Action or active membrane potential** 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.

**30. Give role of 2, 4 Dichlorophenoxyacetic Acid. (LB-2014)**

- 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).



**31. Give two commercial applications of Gibberellins. (LB-2011, 2014, 2018)**

- GA promotes fruit setting e.g., in tangerines and pears and are used for growing seedless grapes (parthenocarpy) and increase the berry size.
- GA3 is used in the brewing industry to stimulate  $\alpha$ -amylase production in barley, and this promotes malting.
- To delay ripening and improve storage life of bananas and grapefruits.

**32. Name and define different types of tropisms. (LB-2008)**

1. Geotropism: the movement under the influence of the stimulus of gravity.
2. Phototropism: the movement under the influence of the stimulus of light.

**33. Give effects of nicotine on blood vascular system and digestive system in man. (OR) What is the action of nicotine on coordination? (LB-2011-2015)**

Nicotine affects post synaptic membrane in CNS and PNS. It mimics the action of acetylcholine on nicotine receptors, so it is stimulant of nerve impulse. It increases the heartbeat rate, blood pressure and digestive tract mobility. Nicotine may induce vomiting and diarrhea and may even cause water retention relation by kidneys.

**34. Explain the functions of two hormones secreted by Islets of Langerhans. (OR) What is the role of insulin and glucagon in the body? (LB- 2013)**

**Insulin** depresses blood glucose levels, in a variety of ways which include increasing glycogen synthesis and increasing cell utilization of glucose. It also stimulates conversion of glucose into lipid and protein, which in turn reduces glucose levels.

**Glucagon** helps in regulating blood glucose (sugar) levels by increasing blood sugar level and prevents it from dropping too low.

**35. Explain imprinting? (LB-2010, 2012)**

Imprinting is a form of learning which is best known in birds such as geese, ducks, and chickens, which are all precocial birds. Shortly after hatching, ducklings and other young birds tend to follow moving objects in their surroundings. They show a brief sensitive period during which the shape of form of objects can be 'imprinted', with the result that the young birds will follow them.

## Ch- 18

### Reproduction

#### Short questions:

**1. What is follicle atresia?**

The pituitary gland on the onset of puberty, releases follicle stimulating hormone (FSH) which stimulates the development of several primary follicles. Only one of these follicles continues to grow with its primary oocytes while the rest break down by a degenerative process known as follicle atresia.

**2. What is after birth?**

Within 10-45 minutes after birth, the uterus contracts and separate the placenta from the wall of the uterus and placenta then passes out through the vagina. This is called after birth. Bleeding, throughout this period, is controlled by the contraction of smooth muscle fibers which surround all uterine blood vessels supplying the placenta. Average loss of blood is about 350 cm<sup>3</sup>

**3. What is the role of placenta in human? (LB-2008)**

A placenta is established between the uterine and foetal tissues for the exchange of oxygen, carbon dioxide, waste, nutrients, and other materials. Placenta also secretes human placental lactogen. Both these hormones stimulate mammary development in preparation for lactation.

**4. What is seed dormancy? Give its importance. (LB-2014)**

It is the special condition of rest, which enables an embryo to survive long periods of unfavorable environmental conditions, such as water scarcity or low temperature. During this period of rest the embryo ceases or limits its growth. This is of great survival importance to the plant in that it prevents the dormant seed from germinating in response to conditions such as a warm spell in winter. Germination or resumption of normal growth by a dormant embryo requires certain, very precise combinations of environmental cues, to avoid any accidental stimulus which may prove fatal later.

**5. What is the role of interstitial cells in sperm production? (LB-2012)**

Between the seminiferous tubules are interstitial cells which secrete testosterone. This hormone is essential for the successful production of sperms and controls the development of male secondary sexual characteristics during puberty.

**6. What is the structure and function of corpus luteum? (LB-2013)**

The follicle cells, after release of the egg, are modified to form a special structure called corpus luteum. This yellowish glandular structure starts secreting hormone called progesterone. This hormone develops the endometrium and makes it receptive for the implantation of the zygote (Placenta formation).

**7. What is parthenocarpy? (OR) Define parthenocarpy with examples. (OR) How does parthenocarpy differ from parthenogenesis? (LB-2010, 2011, 2013)**

In some cases, fruit development proceeds without fertilization and thus no seed formation takes place e.g. banana, pineapples and some varieties of oranges and grapes. Such development is called parthenocarpy. It is due to hormonal imbalance; usually high auxin levels occur in these ovaries. Parthenocarpy is sometimes artificially induced for commercial purposes, by adding auxins in tomato, peppers etc.

**8. Write down at least two important measures to prevent AIDS. (LB-2013)**

The above dreadful sexual diseases can be controlled and prevented by avoiding sexual contacts with carrier or diseased person and adopting the hygienic conditions. The treatment involves medication for a long period except AIDS at present.

**9. What are Oviparous, Viviparous and Ovoviviparous animals? (OR) Give difference between Oviparous and Viviparous animals. (OR) What are Ovoviviparous animals? Give examples. (OR) Differentiate between oviparity and viviparity. (LB-2008, 2009, 2012, 2013)**

Features	Oviparous	Viviparous	Ovoviviparous
<b>Definition</b>	Fertilization is internal. Sperms are lodged in the female body where fertilization occurs. This may lead to external	Internal fertilization leads to internal development and development of embryo is	Internal fertilization leads to internal development of young one in a shelled egg and when development is

	development as in reptiles and birds. They lay shelled eggs to protect the developing embryo from harsh terrestrial conditions.	accomplished inside the female body, which gives birth to young one.	completed, shelled egg is laid which hatches to offspring.
<b>Example</b>	Arthropods	Mammals	Duckbill-platypus

**10. Classify the plants according to photoperiodic requirement for flowering. (OR) Name types of plants according to photoperiodism. (LB-2013, 2015)**

Short-day plants (SDPs)	Long-day plants (LDPs)	Day-neutral plants (DNPs)
Flowering induced by dark periods longer than a critical length, e.g. cocklebur 8.5 h; tobacco 10-11h. (Under natural conditions equivalent to days shorter than a critical length, e.g. cocklebur 15.5 h; tobacco 13- 14h) e.g. cocklebur (Xanthium), chrysanthemum, soyabean, tobacco, strawberry	Flowering induced by dark periods shorter than a critical length, e.g. henbane 13h. (Under natural conditions equivalent to days longer than a critical length, e.g. henbane 11 h). e.g. henbane (Hyoscyamus niger), snapdragon, cabbage, spring wheat, spring barley.	Flowering independent of photoperiod. e.g. cucumber, tomato, garden pea, maize, cotton.

**11. Compare sexual and asexual reproduction. (LB-2015)**

Asexual reproduction	Sexual reproduction (omitting bacteria)
One parent only.	Usually two parents.
No gametes are produced.	Gametes are produced. These are haploid and nuclei of two gametes fuse (fertilization) to form a diploid zygote.
Meiosis absent.	Meiosis is present at some stage in life cycle to prevent chromosome doubling in every generation.
Offsprings identical to parent.	Offsprings are not identical to parents. They show genetic variation as a result of genetic recombination
Commonly occurs in plants, less differentiated animals and micro-organisms. Absent in more differentiated animals.	Occurs in the majority of plant and animal species.
Often results in rapid production of large number of offsprings.	Less rapid increase in number.

**12. Define photoperiodism and write its effects in plants. (OR) Give importance of photoperiodism in plants. (LB-2011, 2016)**

The phenomenon in which variations in day length affects the different processes in plants is called photoperiod.

In plants, photoperiod, and temperature affect lowering, fruit and seed production, bud and seed dormancy, leaf fall and germination. Photoperiod effects flowering, when shoot meristems start producing floral buds instead of leaves and lateral buds.

**13. Define apomixes. (OR) What is meant by apomixes? (OR) What is apomixes (LB-2014, 2018)**

In flowering plants, one form of parthenogenesis is called apomixis. In this a diploid cell of the ovule, either from the nucellus or megaspore, develops into a functional embryo in the absence of a male gamete. The rest of the ovule develops into the seed and the ovary into the

fruit.

**14. Define vernalization. (OR) What is vernalization? (LB-2012, 2018)**

Biennials and perennial plants are stimulated to flowering by exposure to low temperature. This is called vernalization. The low temperature stimulus is received by the shoot apex of a mature stem or embryo of the seed but not by the leaves as in photoperiodism. Temperature around 4°C is found to be very effective. It stimulates the production of “vernalinal” hormone which induces vernalization, it is now believed that vernalinal is nothing special but is gibberellin. vernalization serve to synchronize the reproductive behavior of plants with their environment, ensuring reproduction at favorable times of year. They also ensure that members of the same species flower at the same time, encouraging cross pollination for genetic variability.

**15. Differentiate between haploid parthenogenesis and diploid parthenogenesis. (OR) Define diploid parthenogenesis. (OR) Define diploid parthenogenesis. Give an example. (LB-2012)**

<b>Diploid parthenogenesis</b>	<b>Haploid parthenogenesis</b>
The diploid egg develops into diploid offspring, it is called diploid parthenogenesis.	The haploid egg develops into haploid offspring, it is called haploid parthenogenesis.
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 chromosomes.	In the honeybees, males (or drones) develop from unfertilized eggs. The queen bee, though carrying male gametes from male, can lay eggs that have not been fertilized. The sperms she receives from a drone bee are stored in a pouch closed off by a valve. The eggs may be fertilized or may not be fertilized from the stored sperms.

**16. Differentiate between menopause and ovulation. (OR) Explain menopause and after birth. (LB-2012)**

The human menstrual cycle generally repeats every 28 days although there is considerable variation in different individuals or even within the same individual at different times of her age. The end or complete stop of the menstrual cycle is called menopause, after which the female stops producing the ova.

**17. Differentiate between internal and external fertilization. (LB-2018)**

<b>External fertilization</b>	<b>Internal fertilization</b>
External fertilization occurs in aquatic environment where male gametes can swim towards the female-gametes in water medium. Development is also external due to the constant / stable conditions of water (frog, fish etc.)	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. Others give birth to young ones called viviparous e.g. Mammals.

**18. Differentiate between spermatogenesis and oogenesis. (LB-2009)**

<b>Spermatogenesis</b>	<b>Oogenesis</b>
Sperm production in males	Egg production in females
Each testis consists of a highly complex duct system called seminiferous tubules, in which repeated division by the cells of the germinal epithelium produce spermatogonia. These increase in size and differentiate into primary spermatocytes which undergo meiotic division to form secondary spermatocytes and spermatids. Eventually, the spermatids differentiate into mature sperms.	Germ cells in the ovary produce many oogonia which divide mitotically to form primary oocytes. These are enclosed in groups of follicle cells. The primary oocyte divides meiotically into the haploid secondary oocyte and first polar body. Second meiotic division in the oocyte proceeds as far as metaphase but is not completed until the oocyte is fertilized by the sperm

**19. Differentiate between identical twins and fraternal twins. (OR) How identical twins and fraternal twins are produced? (LB-2010, 2013)**

<b>Identical twins</b>	<b>Fraternal twins</b>
In higher vertebrates including man, zygote after fertilization undergoes cleavage (cell division by mitosis). When embryo is at two celled stages, the two blastomeres, instead of remaining together, may separate and behave as two independent zygotes, each giving rise	In some cases, more than one egg is produced by the female and all these eggs are independently fertilized forming two or more zygote. These zygotes develop into new offspring, but with different genetic combinations. Such a twins or triplets are

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).	called fraternal twins or triplets. They are produced sexually.
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**20. How can you differentiate between menstrual cycle and oestrous cycle? (OR) Define/ Explain oestrous cycle. (LB-2014)**

<b>Menstrual cycle</b>	<b>Oestrous cycle</b>
<ul style="list-style-type: none"> <li>• In females the production of egg is a cyclic activity as compared to males, where gamete production and release is a continuous process beginning at puberty and lasting throughout life.</li> <li>• Egg release does not need any stimulus.</li> </ul>	<p>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 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".</p>

**21. How lactation differ from gestation? (LB-2010)**

Pituitary gland produces luteotropic hormone (LTH). Placenta also secretes human placental lactogen. Both these hormones stimulate mammary development in preparation for lactation.

**22. How are test tube babies produced? (OR) What are test tube babies (LB-2009, 2014).**

Parents which are unable to enjoy the normal process of 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 are 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.



## Chapter 19

### Short questions:

#### **1. What do you mean by open growth? (LB-2011, 2012)**

A plant has a growth pattern called open growth. Throughout life, the plant adds new organs such as branches, leaves and roots, enlarging from the tips of roots and shoot but the rate of growth is not uniform throughout the plant body.

#### **2. What is blastoderm?**

Blastula is characterized by the presence of a segmentation cavity or blastocoele. The discoidal cap of cells above the blastocoele is called blastoderm.

#### **3. What is a cleft palate?**

Individuals with cleft palate have their upper lip folded or the individual has harelip.

#### **4. What is microcephaly?**

In microcephaly, the individuals are born with a small skull.

#### **5. What is neurula? (OR) What is neurocoele? (LB-2015)**

In 24 hour-embryos, the folding of neural plate is clearly visible. The embryo is now termed neurula. With the formation of neural tube, there is formation of central nervous system and the cavity enclosed is known as neurocoele.

#### **6. What is the present goal of gerontology? (LB-2010)**

The present goal of gerontology is not necessarily to increase life span but to increase health span.

#### **7. What is gastrocoel and from which germ layer it is originated? (LB-2013)**

In an 18-20 hours embryo, the cavity between the yolk and the endoderm has been called gastrocoele. It is formed by invagination of mesoderm and endoderm cells.

#### **8. What is Henson's node? Give its role. (LB-2012)**

At the cephalic end of primitive streak, closely packed cells form a local thickening known as Hensen's node. From Hensen's node, dorsal mesoderm is formed and is organized into somites.

#### **9. What is meant by discoidal cleavage? (LB-2016)**

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 to as discoidal cleavage.

**10. What is meristem? (OR) Define meristem. Name its types based on position. (OR) Describe various types of meristems. (OR) What is apical meristem? (OR) What are intercalary meristems. Give their role. (OR) What do you mean by lateral meristem. (LB-2013, 2015, 2016, 2017, 2018)**

**Apical meristems** are found at the tips of roots and shoots 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 the increase in the number of cells at the tips of roots and stem, so they play an important role in primary growth.

**Intercalary meristem:** These are the parts of apical meristem which get separated from apex by permanent tissues. They are situated at the bases of internodes in many plants. They play an important role in the production of leaves and flowers. These are of a temporary nature.

**Lateral meristems** are cylinders of dividing cells. They are present in dicots and gymnosperms. Vascular and cork cambium are the examples of lateral meristem. T

**11. What is the difference between epiblast and hypoblast? (LB-2017)**

During gastrulation, the blastoderm splits into two layers: an upper layer of cells called epiblast, and a lower layer of cells called hypoblast.

**12. What is the difference between inhibitory effect and compensatory effect?**

Apical dominance is caused by auxin diffusing from the apical bud which inhibited the growth of lateral shoots is called inhibitory effect. The removal of apex releases the lateral buds from apical dominance. It is called the compensatory effect.

**13. Write down the names of different kinds of cytoplasm's with their functions.**

1. Clear cytoplasm. It produces larval epidermis.
2. Yellow cytoplasm. It gives rise to muscle cells.
3. Gray vegetal cytoplasm. It gives rise to gut.
4. Grey equatorial cytoplasm. It produces notochord and neural tube.

**14. Briefly describe the external and internal factors that affect growth in plants. (LB-2009)**

External	Internal
Temperature Light Oxygen Carbon dioxide Water Nutrition	Hormones Vitamins

**15. Define aging and write its symptoms. (OR) Give symptoms of aging. (OR) What are important signs of aging in human beings? (OR) What are the causes of aging and how aging can be slowed down? (LB-2014) 16. Define gastrulation in chick. (LB-2013)**

Aging is an inevitable process and despite all the efforts to inhibit or stop it the aging process goes on. It can be defined as negative physiological changes in our body. We identify the adult individual by the following signs of old age, all of them need not be present e.g., 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.

**17. Define growth correlations. (LB-2018)**

The development of a plant is usually correlated with its growth and different organs growing at different rates in different directions and the development of different parts takes place. Such reciprocal relationship is known as correlation.

**18. Define neurocoel, blastocoel and gastrocoel.**

- With the formation of neural tube, there is formation of central nervous system and the cavity enclosed is known as **neurocoel**.
- The morula stage is short-lived and soon changes into blastula and is characterized by the presence of a segmentation cavity or **blastocoel**.
- The cavity between the yolk and the endoderm, which is called **gastrocoel**.

**19. Define organizer and inducer substance. (OR) What are primary organizer and inducer substances? (LB-2009, 2013)**

It was seen that only cells from the dorsal lip of blastopore could induce a complete embryo. The dorsal lip area was called the **primary organizer** because it was the only tissue capable of inducing development of secondary embryo in the host.

**20. Define regeneration with examples. (LB-2011)**

The ability to regain or recover the lost or injured part of the body is called regeneration.

**Examples:**

- In sponges, due to simple organization sponges possess greater 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.
- A lizard can easily discard its tail, but tail can be regenerated by special features of its tail.

**21. Define teratology and teratogens? (OR) Define teratology. (LB-2018)**

Teratology is the branch of biology, which deals with these abnormal developments and causes for such developments. Environmental factors causing or contributing to abnormal development are grouped together as teratogens.

**22. Differentiate between area pellucida and area opaca.**

At gastrula stage, the central cells of blastoderm can be separated from the yolk, under these central cells a pool of fluid develops, raising them off the yolk and giving the area a translucent appearance - the **area pellucida**.

The peripheral part of the blastoderm where the cells lie unseparated from the yolk is termed **area opaca**.

**23. Differentiate between gerontology and teratology. (LB-2010)**

**Gerontology** is the study of aging.

**Teratology** is the branch of biology, which deals with these abnormal developments and causes for such developments.

**24. Differentiate between growth and development. (OR) Define growth. (LB-2010, 2016, 2017)**

**Growth:** The permanent and irreversible increase in size that occurs as an organism matures.

**Development:** The progressive changes which are undergone before an organism acquires its adult form constitute embryonic **development**.

**25. Differentiate between morula and blastula.**

In Chick embryo development, Cleavage results in the formation of a rounded closely packed mass of blastomeres. This is morula, it consists of a disc shaped mass of cells two or more layers in thickness (blastoderm) lying close to the yolk. The **morula stage** is short-lived and soon changes into blastula.

**Blastula** stage is characterized by the presence of a segmentation cavity or blastocoele.

**26. Differentiate between primary and secondary growth. (LB-2018)**

(i) **Primary Growth:** Primary' tissue is added by the apical meristem

(ii) **Secondary Growth:** Secondary tissue is added by the intercalary or vascular cambium leading to increase in thickness

**27. Give the name of the two sheets like layers into which mesoderm splits and name the cavity formed between these. (OR)**

**Differentiate between somatic and splanchnic mesoderm. (LB-2012, 2013)**

Mesoderm is split into two sheet like layers viz somatic mesoderm and splanchnic mesoderm, with a space between them. The cavity formed between somatic and splanchnic mesoderm is coelom.

**28. How is final size of cells of cortex and tracheids is attained in zone of maturation? (LB-2013)**

The cells which develop into pith, cortex and certain other tissues do not elongate further along the axis, while other cells like fibers and tracheids elongate lengthwise more than in other direction. This results in maturation.

**29. How notochord is formed in chick embryo? (LB-2011)**

Shortly, after the primitive streak has been formed and the endoderm is well established, cells begin to push in from the region of Hensen's node to form the rod like notochord in the midline beneath the ectoderm.

**30. How primitive streak is formed? (LB-2008)**

The mesodermal cells migrate medially and caudally from both sides and create a mid-line thickening called primitive streak. In chick embryo of about 18 hours, notochord is one of the few prominent structural features.

**31. State dedifferentiation of cells. (LB-2012)**

Dedifferentiation of cells means that become less specialized, during regeneration, so that they can then proceed to differentiate into the same and probably different types of cells.

**32. State the role of gray vegetal and grey equatorial cytoplasm. (LB-2012)**

- Gray vegetal cytoplasm: It gives rise to gut.
- Grey equatorial cytoplasm: It produces notochord and neural tube.

**FORMAN CHRISTIAN COLLEGE**  
**(A Chartered University)**  
**QUESTION BANK PART II BIOLOGY**  
**Chapter No. 20**  
**Chromosome and DNA**

**Short questions:**

1. What is semi-conservative replication of DNA? (LB-2015)

**Ans: Semi-Conservative Replication:**

In semi-conservative replication of DNA, two strands of the parental DNA duplex separate out, each acting as a model, along which appropriate complementary nucleotides are assembled, thus form two daughter duplexes with the same sequences. This form of DNA replication is called **semi-conservative**, because while the sequence of original duplex is conserved after one round of replication, the duplex itself is not. Instead, each strand of parental duplex becomes part of the daughter duplexes.

2. What is sickle cell anemia? (LB-2016)

**Ans: Sickle cell anemia:**

In sickle cell anemia a point mutation replaces a single **thymine** with **adenine** at position **6** from N terminal end in **hemoglobin beta chain**. It leads to the change of amino acid **glutamic acid** into **valine**. This consequently alters the tertiary structure of hemoglobin molecule reducing its ability to carry oxygen. Moreover, in this disease the red blood cells are shaped like sickles or crescent moons. These sickle cells also become rigid and sticky which can slow or block the blood flow.

3. What is transformation? (OR) Define transformation. In which bacterium it was discovered? (LB-2011, 2016, 2021)

**Ans: Transformation:**

It is the transfer of genetic material from one cell to another and can alter the genetic makeup of the recipient cell. The genetic material '**DNA**' which is responsible for transformation is called Transforming Principle.

**Bacterium:**

It was discovered in *Streptococcus pneumoniae* bacterium.

4. What is translation? (LB-2014, 2015)

**Ans: Translation:**

Translation is the process by which cell makes proteins using genetic information from messenger RNA (mRNA). It occurs when information contained in mRNA is used to direct the synthesis of polypeptide chain by ribosomes. This process is called **translation**, because the nucleotide sequence of the mRNA is translated into an amino acid sequence of polypeptide. It takes place in the **cytoplasm** of the cell.

5. What are mutagens? Give one example. (LB-2018)

**Ans: Mutagens:**

Mutagens are substances or agents that cause alteration in the DNA sequence. This alteration in DNA sequence is known as mutation.

**Examples:**

Some common examples of mutagens are:

1. **Radiation (UV rays)**
2. **Chemicals (Nitrous acid)**

6. What are the contributions of P.A. Levene for determining the structure of DNA? **(LB-2017)**

**Ans: Contributions of P.A Levene:**

In 1920, he determined the basic structure of nucleic acids. P.A. Levene found that DNA contains three basic components:

1. Phosphate group
2. Five carbon sugar (Deoxyribose)
3. Nitrogenous bases (A, G, C, T)

He further concluded that DNA and RNA molecules are made up of repeating units of **Nucleotides**.

7. What is phenylketonuria? **(OR)** What is alkaptonuria? **(OR)** Differentiate between alkaptonuria and phenylketonuria.

**Ans:**

<b>Phenylketonuria</b>	<b>Alkaptonuria</b>
It is hereditary disease in which phenylalanine is not degraded because of defective enzyme <b>phenylalanine hydroxylase</b> . Consequently, phenylalanine accumulates in the cells leading to <b>mental retardation</b> , as the brain fails to develop in infancy. This disorder is due to a point mutation.	In alkaptonuria, the patients produce urine that contain homogentisic acid. This substance oxidizes rapidly when exposed to air, turning the urine <b>black</b> . In normal individuals, homogentisic acid is broken down into simpler substances. But patients suffering from alkaptonuria lacked the enzyme necessary to catalyze this breakdown.

8. What is central dogma? **(LB-2018)**

**Ans: Central Dogma:**

The mechanism of reading and expressing genes is referred to as central dogma. It consists of the two main steps.

1. **Transcription:** It is the process in which mRNA is synthesized from DNA.
2. **Translation:** It is the process in which protein is synthesized by ribosomes using genetic information contained in mRNA.

9. What is genetic code? **(OR)** What are non-sense codons? **(OR)** Enlist non-sense codons and their function. **(OR)** Differentiate between genetic code and stop codon.

**Ans:**

	<b>Codon or Genetic code</b>	<b>Non-Sense Codon</b>
<b>Define</b>	<b>Genetic code</b> is a combination of three adjacent nucleotides in DNA or mRNA that code for a particular amino acid.	Out of 64 codons, three codons <b>UAA, UAG,</b> and <b>UGA</b> do not code for any amino acid. So, these codons are called <b>non-sense codons</b> .

<b>Function</b>	Each genetic code or codon, codes for a specific amino acid.	<b>Non-sense codons</b> are usually present at the end of the gene and stop the further assembly of polypeptide chain. Hence, they are also called <b>stop codons</b> .
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10. Where are codon and anticodon situated? (LB-2012, 2014, 2018)

Ans:

	<b>Codon</b>	<b>Anticodon</b>
<b>Define</b>	A <b>codon</b> is a sequence of three nucleotide in DNA or mRNA that either codes for a particular amino acid or tells the cellular machinery to start or stop using the successive codes. A group of codons starts with the initiation codon.	While <b>Anticodons</b> are sequences of nucleotides that are complementary to codons. They are found in tRNAs and allow the tRNAs to bring the correct amino acids to bind to the exposed codon on mRNA during protein synthesis.
<b>Situated</b>	DNA or mRNA	tRNA

11. What is heterochromatin? (OR) What is euchromatin? (OR) Differentiate between heterochromatin and euchromatin. (LB-2016, 2018, 2021, 2022)

Ans:

<b>Heterochromatin</b>	<b>Euchromatin</b>
Highly condensed portions of the chromatin are called <b>heterochromatin</b> . Some of these portions remain permanently condensed, so that their DNA is never expressed.	The portions of the chromatin present in an open configuration and its genes can be expressed is called <b>Euchromatin</b> . It condenses during cell-division.

12. What is mutation? (OR) What do you mean by mutations? (OR) Define mutation and differentiate between chromosomal aberration and point mutation. (LB-2010, 2013, 2017)

Ans:

**Mutations:**

It is defined as a permanent change in the DNA of cell. It includes changes in nucleotide sequences, alteration of gene position, gene loss or duplication and insertion of a foreign sequence. These changes in the DNA occur either due to mistake in replication or damage to the genetic message causing mutation.

Mutations are of two types.

- Chromosomal aberrations.
- Point mutations.



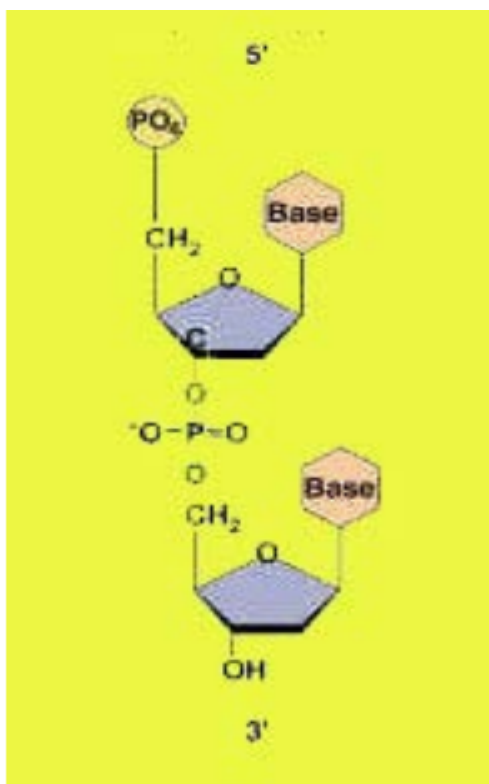
	<b>Chromosomal aberrations</b>	<b>Point Mutations</b>
<b>Definition</b>	These are mega changes in DNA. These may involve presence of an extra chromosome or loss of chromosome from the diploid number of chromosomes or changes like deletions, insertions, or inversions etc. in the parts of chromosomes. Such chromosomal aberrations lead to syndromes.	These 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 <b>point mutations</b> .
<b>Examples</b>	Down's syndrome, Turner's Syndrome etc.	Sickle cell anemia, phenylketonuria etc.

13. What is phosphodiester linkage? Draw structural formula. **(OR)** What is phosphodiester bond or linkage? **(OR)** Sketch phosphodiester linkage between two nucleotides. **(LB-2013, 2015, 2016)**

**Ans: Phosphodiester Bond:**

The reaction between the phosphate group of one nucleotide and the hydroxyl group of another is dehydration synthesis, eliminating a water molecule and forming a covalent bond that links the two groups. This linkage is called **phosphodiester bond** because the phosphate group is linked the two sugars by means of a pair of ester (P-O-C) bonds.

**Sketch of Phosphodiester Bond:**



*20.11 A phosphodiester*

14. Compare replication, transcription, and translation.

Ans:

	<b>DNA Replication</b>	<b>Transcription</b>	<b>Translation</b>
<b>Definition</b>	<b>DNA replication</b> is the process by which a double stranded DNA molecule is copied to produce two identical DNA molecules.	<b>Transcription</b> is the process in which an <b>RNA</b> copy of the DNA sequence encoding the gene is produced with the help of an enzyme <b>RNA polymerase</b> .	Translation is the transfer of information from mRNA to proteins. It occurs when information contained in mRNA is used to direct the synthesis of polypeptide chains by ribosomes. This process is called <b>translation</b> , because the nucleotide sequence of the mRNA is translated into an amino acid sequence of the polypeptide/protein.
<b>Synthesize</b>	Two molecules of DNA	mRNA	Protein

15. Define chromosomal theory of inheritance. (LB-2010, 2014)

Ans: **Chromosomal theory of inheritance:**

It was presented by **Walter Sutton** in **1902**. According to this theory, the genes are located on the chromosomes. The similar chromosomes pair with one another during meiosis. It means that one member of gene pair is located on one homologous chromosome and the other member of a gene pair is located on another homologous chromosome. The homologous chromosomes segregate during meiosis.

16. Define karyotype. (OR) What is karyotype? (OR) What do you mean by karyotype? Give its significance. (OR) What is karyotype? Give its application in species recognition. (LB-2014, 2022)

Ans: **Karyotype:**

The morphology of chromosomes of an organism as viewed with light microscope is called **Karyotype**.

(OR)

A particular array of chromosomes that an individual possesses is called its **Karyotype**.

**Significance:**

Karyotype shows **differences** among species and sometimes among the individuals of the same species.

17. Define nucleosome. (LB-2012)

Ans: **Nucleosome:**

Every 200 nucleotides, the DNA duplex is coiled around a core of eight histone proteins forming a complex known as **Nucleosome**.

18. Define nucleotide and nucleoside. (OR) What is nucleotide? (OR) Differentiate between nucleotide

and nucleoside. (LB-2017, 2021)

Ans:

Nucleotide	Nucleoside
<p><b>Nucleotide</b> is a single/basic unit of nucleic acids. Each nucleotide is made up of <b>three</b> components:</p> <ol style="list-style-type: none"> <li>1) Phosphate group</li> <li>2) Five-carbon sugar</li> <li>3) Nitrogenous base</li> </ol> <p>Nitrogenous base is attached to carbon number <b>1</b> of pentose sugar and phosphate is attached to the carbon number <b>5</b> of the sugar.</p>	<p><b>Nucleoside</b> is a compound which consists of <b>two</b> components:</p> <ol style="list-style-type: none"> <li>1) Five-carbon sugar</li> <li>2) Nitrogenous base</li> </ol>

19. Define one gene/one polypeptide hypothesis? (LB-2017)

Ans: **One-gene /one-polypeptide:**

Beadle and Tatum concluded that genes produce their effects by specifying the structure of enzymes and that each gene encodes the structure of one enzyme. They called this relationship as one gene /one enzyme hypothesis. But many enzymes contain multiple protein or polypeptide subunits, each encoded by a separate gene. Thus, the hypothesis is today more commonly referred to as ‘**one gene/one polypeptide**’.

20. Define point mutation. (OR) State point mutation with examples. (OR) Define point mutations. Give one example. (OR) What is point mutation? Give an example. (LB-2012, 2014, 2018, 2019)

Ans: **Point Mutations:**

These 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**.

**Example:**

- Sickle cell anemia
- Phenylketonuria

21. Define transcription and how it is initiated? (OR) What is the function of RNA polymerase in transcription? (LB-2010, 2013)

Ans: **Transcription:**

It is the process in which an RNA copy of the DNA sequence encoding the gene is produced with the help of an enzyme RNA polymerase. Transcription proceeds from 5’- 3’ direction of the template or antisense strand of DNA duplex.

22. Differentiate among conservative, semi-conservative and dispersive replication of DNA.

Ans:

Conservative Replication	Semi-Conservative Replication	Dispersive Replication
In <b>conservative replication</b> , the parental DNA double helix would remain intact (unbroken) and generate DNA	In <b>semi-conservative replication</b> , the two strands of the DNA duplex separate out, each acting as a model along which	In <b>dispersive model</b> , the parental DNA would become completely dispersed and that each strand of all daughter

copies consisting of entirely new molecules.	new nucleotides are arranged, thus giving rise to two new duplexes. In this process primary structure by separation of two strands, primary structure is conserved whereas secondary structure is disrupted.	DNA molecules is a 'mixture' or "hybrid" of parental and daughter DNA.
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23. Differentiate between leading and lagging strand. (LB-2021)

Leading Strand	Lagging Strand
During replication of DNA, the leading strand is that which elongates towards the replication fork. It is built up simply by adding nucleotides continuously to its growing 3' end.	During replication of DNA, the lagging strand is that which elongates away from the replication fork and is synthesized discontinuously as a series of short fragments called as <b>Okazaki fragments</b> . These fragments are later connected.

24. Differentiate between sense and antisense strands of DNA. (OR) What is the difference between template and sense strand? (LB-2018, 2019)

Sense Strand	Antisense/Template Strand
The strand opposite to antisense strand is called <b>sense strand</b> or <b>coding strand</b> . It is the strand of DNA that has the same sequence as the mRNA.	Antisense is the non-coding DNA strand of a gene. A cell uses antisense DNA strand as a <b>template for producing messenger RNA</b> (mRNA) that directs the synthesis of a protein. It is also known as <b>template strand</b> .

25. Enlist different shapes of chromosome. (LB-2012)

**Ans: Shapes of Chromosomes:**

Depending upon the location of the centromere between the middle and tip of chromosomes. Chromosomes acquire different shapes at the time of anaphase during cell division.

**Examples:**

Types of Chromosomes	Shape
Telocentric and Acrocentric	i shaped
Sub-meta centric	j shaped.
Meta-centric	v shaped.

26. Give the length of Okazaki fragment. (OR) What are Okazaki fragments? (LB-2015, 2016, 2021)

**Ans: Okazaki Fragment:**

Okazaki fragment is a short fragment of DNA produced by discontinuous replication of the lagging strand elongating in the 5'-3' direction away from the replication fork. When polymerase reaches 5'

end of the lagging strand, DNA Ligase attaches the fragment to the strand.

**Length of Okazaki Fragments:**

Okazaki Fragments are about **100-200** nucleotides long in eukaryotes and **1000-2000** nucleotides long in prokaryotes.

27. Give the role and kinds of tRNA. (LB-2013)

**Ans: Role of Transfer RNA (tRNA):**

Transfer RNA molecules transport 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.

**Kinds of Transfer RNA (tRNA):**

Human cells contain about **45** different kinds of tRNA molecules.

28. How many types of DNA polymerases are found, write down their names? (LB-2017)

**Ans:** There are three main types of DNA polymerase found in cell for replication. Following are the names:

1. DNA Polymerase I
2. DNA Polymerase II
3. DNA Polymerase III

29. Write two characteristics of DNA polymerase III. (LB-2019)

**Ans:**

- DNA polymerase III is true *E. coli* replicating enzyme.
- It is 10 times larger and far more complex in structure.
- It is a dimer and catalyzes the replication of one DNA strand.
- It moves at a rapid rate and adds some **1000 nucleotides/second** to the growing strand of DNA.
- It can add nucleotides only to a chain of nucleotides that is already paired with the parent DNA strands.

30. Why cap and tail are added to eukaryotic RNA, when it leaves from nucleus to cytoplasm? (LB-2019)

**Ans:** The '**7 methyl GTP**' cap and **poly A tail** are added to eukaryotic RNA because these two save the mRNA from variety of nucleases and phosphates that can cleave (break) the mRNA.

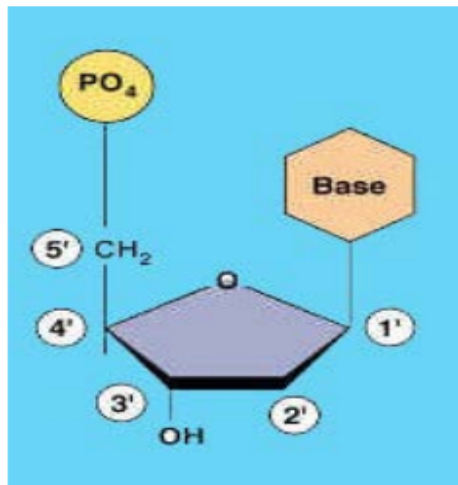
31. Define promoter and what is its role. (OR) Describe promoter area in transcription. (LB-2019, 2022)

**Ans: Promoter:**

**It is a particular binding site located upstream of the gene.**

32. Draw structural formula of nucleotide. (LB-2021)

**Ans:**



*Fig 20.10 Numbering the carbon atoms in a nucleoties*

33. Why does every genetic code consist of three nucleotides? (LB-2022)

**Ans:** There are **three nucleotides** in a codon because of the following reasons:

- A two-nucleotide codon would **not** yield enough combinations to code for the **20 different amino acids** that commonly occur in proteins.
- With **four** DNA nucleotides (A, C, G and T) only 42 or **16 different pairs** of nucleotides could be formed.

Therefore, nucleotides are arranged in the combinations of **three**, that yield **43 or 64 different codons**, which are more than enough to code for the 20 amino acids.

34. What do you know about the minimal medium used by Beadle and Tatum? (LB-2022)

**Ans:** Beadle and Tatum used a **minimal medium** that contained **only sugar, ammonia, salts, a few vitamins, and water.**

35. Give the composition of chromosomes. (LB-2022)

**Ans:** Chromosomes are composed of

- **40% DNA**
- **60% Protein**
- **A significant amount of RNA** which is associated with chromosomes. These are the sites of RNA synthesis

## Chapter No. 21

### Cell Cycle

#### Short questions:

1. What is Necrosis? (LB-2014)

**Ans: Necrosis:**

The cell death due to tissue damage is called necrosis. During necrosis the typical cell swells and bursts, releasing the intra cellular contents, which can damage neighboring cells and cause inflammation.

2. What is tumor? (LB-2014)

**Ans: Tumor Formation:**

Sometimes the control, that regulates the cell multiplication, breaks down. A cell in which this occurs, begins to grow, and divide in unregulated fashion without body's need for further cells of its type. When such cells produce new cells which continue to proliferate (multiple) in uncontrolled fashion, an **unwanted clone of cells** called **tumor** is formed.

These are of two types of tumors:

1. Benign tumor
2. Malignant tumor

3. What is Klinefelter's syndrome? (LB-2016)

**Ans:**

**Klinefelter's syndrome:**

It is one of the genetic disorders that occur due to non-disjunction of **sex** chromosomes pair in human.

1. **Additional X chromosome:**

The individuals will have **additional X** chromosome e.g., males with 47 chromosomes (44 autosome + XXY), with 48 chromosomes (44 autosomes + XXXY), and with 49 chromosomes (44 autosomes + XXXXY).

**Symptoms:**

They are phenotypically **male** but frequently have

- enlarged breasts
- tendency to tallness
- obesity
- small testes with no sperms at ejaculation
- under-developed secondary sexual characters

2. **Additional Y chromosome:**

The individuals will have **additional Y** chromosome e.g., Males with 47 chromosomes (44 autosomes + XYY) are also observed.

4. What is metastasis? (LB-2016)

**Ans: Malignant Tumors / Metastasis:**

The cells composing a malignant tumor or cancer, divide more rapidly, mostly invade surrounding tissue, get into body's circulatory system and setup 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**.

5. What is the importance of bivalent formation? (LB-2012)

**Ans: Bivalent or Tetrad:**

During Zygotene stage of prophase I of meiosis, the **homologous chromosomes synapse (pair)** with each other. Each paired but not fused complex structure is called **Bivalent or Tetrad**.

6. What happens during metaphase I? (LB-2013)

**Ans: Metaphase-I:**

During **metaphase I:**

- Nuclear membrane disorganizes.
- Spindle fibers originate and the kinetochore fibers attach to the kinetochore of homologous chromosome from each pole and arrange the bivalents at the equator.
- The sister chromatids of individual chromosome in bivalent behave as a unit.

7. What are mutagens? Give one example. (LB-2018)

**Ans: Mutagens:**

Mutagens are chemical compounds or forms of radiation (such as ultraviolet (UV) or X-rays) that cause irreversible and heritable changes (mutations) in the cellular genetic material, '**deoxyribonucleic acid (DNA)**'.

8. What are the apparent symptoms or effects of Down's syndrome? (OR) What is Down's syndrome? (OR) Describe causes and symptoms of Down's syndrome. (OR) Write symptoms of Down's syndrome. (LB-2014, 2018)

**Ans:**

- **Down's syndrome or Mongolism:**

It is a human genetic disorder that occurs due to **autosomal** non-disjunction of **21<sup>st</sup> pair of chromosomes**.

- **Additional autosomal chromosome:**

During this 21<sup>st</sup> pair of chromosome fails to segregate (separate), resulting in gamete with 24 chromosomes. When this gamete, fertilizes a normal gamete, the individual will have 47 (2n+1) chromosomes.

This non-disjunction occurs in ova and is related to the age of the mother. It is more common in older mother (45 years)

- **Symptoms:**

The affected individuals have

- flat and broad face
- squint eyes with the skin fold in the inner corner
- protruding tongue
- mental retardation
- defective development of central nervous system



9. What are the symptoms of Turner's syndrome? **(OR)** How Turner's syndrome is caused and give its features. **(OR)** What is Turner's syndrome? **(LB-2013, 2014, 2022)**

**Ans:**

- **Turner's syndrome:**

It is a genetic disorder that occur due to the non-disjunction of sex chromosomes.

- **Missing one X chromosome:**

The affected individuals have **one missing X-chromosomes**, with only 45 chromosomes (44 autosomes + XO).

- **Symptoms:**

The individuals with Turner's syndrome often do not survive pregnancy and are aborted.

Those who survive have

- female appearance with short stature
- webbed neck
- without ovaries
- complete absence of germ cells

10. What is Apoptosis? **(OR)** Differentiate between Necrosis and Apoptosis. **(OR)** How cell death (Apoptosis) is beneficial for organisms? **(LB-2014, 2019)**

**Ans:**

<b>Necrosis</b>	<b>Apoptosis</b>
The cell death due to tissue damage is called <b>necrosis</b> . During necrosis, the typical cell swells, and bursts, releasing the intra cellular contents, which can damage neighboring cells and cause inflammation.	Apoptosis is the internal program of events and sequence of morphological changes by which cell commits suicide is collectively called as frequently. The dying cell shrinks and condense, ultimately splits up into small vesicles the apoptotic bodies. These apoptotic bodies are then phagocytosed, so they have no deleterious effects.

11. What is mitotic apparatus? **(OR)** What is mitotic apparatus? Give its functions. **(OR)** Describe mitotic apparatus. **(LB-2013, 2016, 2018, 2019, 2022)**

**Ans:**

**Mitotic Apparatus:**

The specialized microtubule structure including asters, and spindles is called **mitotic apparatus**. This is larger than the nucleus.

**Functions:**

It is designed to attach and capture chromosomes, aligning them at equator and finally separating them so that equal distribution of chromosomes is ensured.

12. Define cell cycle. (OR) Sketch and label cell cycle. (LB-2010, 2015)

**Ans: Cell cycle:**

The cell undergoes a sequence of changes which involves period of growth, replication of DNA, followed by cell division. This sequence of changes is called **cell cycle**.

It comprises of two phases:

- Inter-phase
- Mitotic Phase

**Sketch of Cell cycle:**

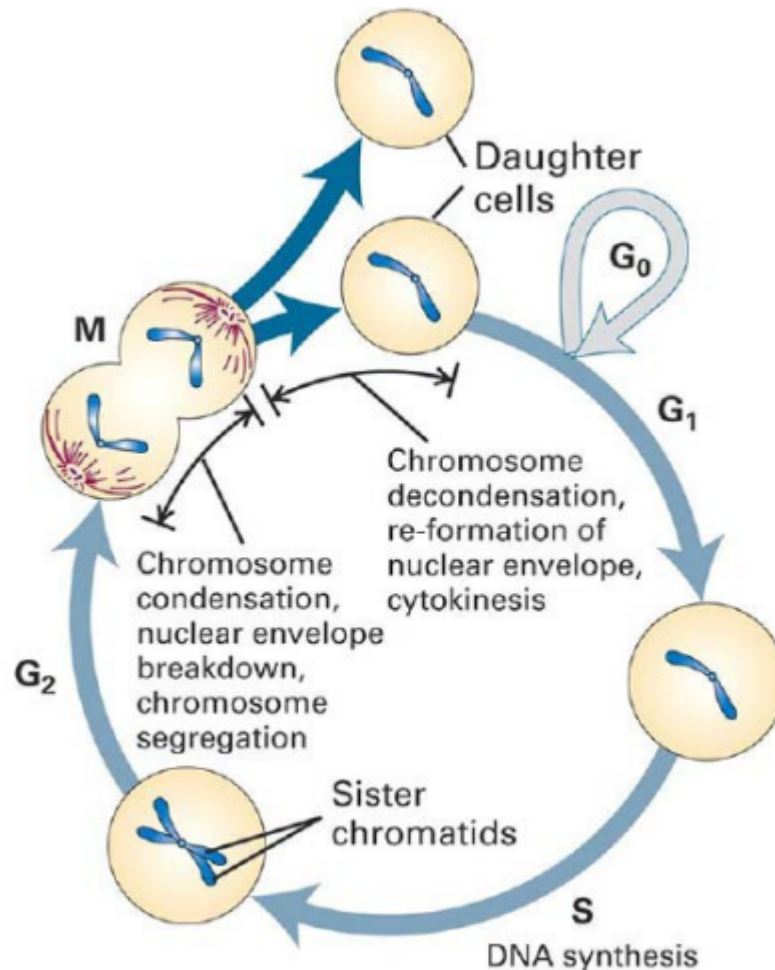


Fig. 21.1 The fate of a single parental chromosome throughout the eukaryotic cell cycle.

13. Define non-disjunction. (OR) What is non-disjunction or meiotic errors? (OR) What do you mean by non-disjunction? (OR) What is meant by non-disjunction? Write its consequences. (LB-2017, 2021)

**Ans: Meiotic Errors (Non-disjunctions):**

Sometimes during meiosis chromosomes fail to segregate during anaphase and telophase and do not finish with equal distribution of chromosome among all the daughter nuclei. This results either increase or decrease in the number of chromosomes, causing serious physical, social and mental disorders. Non-disjunction may be autosomal or sex-chromosomal e.g., Mongolism, Turner's and Klinefelter's syndrome.

14. Define karyokinesis and cytokinesis. (OR) How do karyokinesis and cytokinesis phases of cell division differ? (LB-2014)

Ans:

Karyokinesis	Cytokinesis
<p>The division of the <b>nucleus</b> is termed as <b>Karyokinesis</b>. It involves the following phases:</p> <ul style="list-style-type: none"> <li>• Prophase</li> <li>• Metaphase</li> <li>• Anaphase</li> <li>• Telophase.</li> </ul>	<p>The division of <b>whole cell</b> is called <b>cytokinesis</b>. During late telophase the astral microtubules send signals to the equatorial region of the cell, where actin and myosin proteins are activated and form a contractile ring, followed by cleavage furrow, which deepens towards the center of the cell, dividing the parent cell into two daughter cells.</p>

15. Define meiosis and mitosis.

Ans:

Mitosis	Meiosis
It is the type of cell division, which ensures the <b>same number</b> of chromosomes in the daughter cells as that in the parent cells.	Meiosis is the special type of cell division in which the number of chromosomes in daughter cells is <b>reduced to half</b> , as compared to the parent cell.
It can take place in <b>haploid</b> as well as in <b>diploid</b> cells.	It takes place only in <b>diploid</b> cells.
After mitosis, each cell produces <b>two daughter cells</b> .	After meiosis, each diploid cell produces <b>four haploid cells</b> .
It occurs in plants as well as in animals, nearly in all parts of the body if and when required.	<p>Likewise, it occurs in plants as well as in animals.</p> <ul style="list-style-type: none"> <li>• In animals, it occurs at the time of <b>gamete formation</b></li> <li>• In plants, it occurs when <b>spores are produced</b>.</li> </ul>

16. What is the importance of mitosis and meiosis? (OR) Give two main importance of meiosis. (LB-2013, 2017)

Ans:

**Importance of Mitosis:**

- Provides equal distribution of chromosomes to the daughter cells.
- Genetic information remains unchanged generation after generation.
- Involved in **asexual reproduction** of animals and plants.
- Helps in regeneration, healing of wounds, and replacement of older cells.
- Orderly controlled mitosis helps in growth and development of multicellular organisms.
- Helps in tissue culture and cloning.

**Importance of Meiosis:**

- Crossing over results in a large number of recombinations.
- Random assortment during anaphase gives a wide range of variety of gametes.
- Both crossing over and random assortment cause variations and modifications in the genome. These variations are not only the bases of evolution but also make every individual specific, particular, and unique in his characteristics. Even the progeny (offspring's) of same parents i.e., brothers and sisters are not identical to each other.
- Helps to maintain the number of chromosomes constant generation after generation.

17. Differentiate between benign and malignant tumor.

**Ans:**

<b>Benign Tumors</b>	<b>Malignant Tumors / Metastasis</b>
These tumors are of small size and localized, not transferred to other parts. Benign tumor cells usually behave like normal cells and have little deleterious effects only due to either its interference with normal cells or its hormone-like secretions.	The cells composing a malignant tumor or cancer, divide more rapidly, mostly invade surrounding tissue, get into 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 <b>metastasis</b> .

18. Differentiate between G<sub>0</sub>-phase and S-phase of interphase. **(OR)** Describe changes occur during G<sub>1</sub>-phase. **(LB-2011, 2012, 2016)**

**Ans: Phases of Inter phase:**

It is divided into the following sub phases.

- **G<sub>1</sub> or Gap 1:**  
It is the period of extensive metabolic activity in which cell normally grows in size, specific enzymes are synthesized, and DNA base units are accumulated for DNA synthesis.
- **G<sub>0</sub>:**  
Post mitotic cell can exit the cell cycle during G<sub>1</sub> entering G<sub>0</sub> and remain for days, weeks or in some cases for lifetime (e.g., nerve cells and cells of the eye lens) of the organism without proliferating further.
- **S-Phase (Synthesis phase):**  
Following the G<sub>1</sub> is the S-Phase during which the DNA is synthesized by replication and chromosome number is doubled.
- **G<sub>2</sub> or Gap 2 (Pre-mitotic phase):**  
This phase prepares the cell for division e.g., energy storage for chromosome movements, mitosis specific proteins, RNA, and microtubule subunits (for spindle fibers) synthesize.

19. Differentiate between interphase and mitotic phase.

**Ans:**

<b>Interphase</b>	<b>Mitotic phase</b>
<p>The period of life cycle of cell (cell cycle) between two consecutive divisions is termed as the interphase or misleadingly called <b>resting phase</b>. It is the period of <b>great biochemical activity</b>. It is further subdivided into different sub phases.</p> <ul style="list-style-type: none"> <li>• G<sub>1</sub>-phase</li> <li>• S-phase</li> <li>• G<sub>2</sub>-phase</li> </ul>	<p>It is the period of division also known as <b>mitotic phase</b>. It is further subdivided into different sub-phases.</p> <ol style="list-style-type: none"> <li>1. Karyokinesis <ul style="list-style-type: none"> <li>• Prophase</li> <li>• Metaphase</li> <li>• Anaphase</li> <li>• Telophase</li> </ul> </li> <li>2. Cytokinesis</li> </ol>

20. Give events of Zygotene. (LB-2013)

**Ans: Zygotene:**

It is a sub phase of prophase-I of meiosis. In this phase the pairing of homologous chromosomes called **synapsis** starts. This pairing is highly specific and exactly pointed, but with no definite starting point. Each paired but not fused, complex structure is called as **Bivalent or tetrad**.

21. How can you identify Cancer cells? (OR) Cancer is uncontrolled cell division, explain. (OR) What are cancer cells? How cancer cells can be distinguished from normal cells? (OR) Write any two differences between normal cells and cancer cells. (LB-2011, 2019, 2021, 2022)

**Ans: Identification of cancer cells:**

Cancer cells:

- Are less differentiated than normal cells.
- Exhibit characteristics of rapidly growing cells.
- Have high nucleus to cytoplasm ratio.
- Have prominent nucleoli.
- Undergo many mitosis.

22. In what respects does mitosis in plant cells differ from that in animal cells? (OR) Explain cytokinesis in plants. (OR) How cytokinesis occurs in plants? (LB-2010, 2018)

**Ans:** Mitosis in plant cells differ from that in animal cells just in **cytokinesis**.

<b>Difference</b>	
<b>Cytokinesis in animals</b>	<b>Cytokinesis in plants</b>
Animals have centrioles which give rise to spindle microtubules radiate	Most higher plants lack visible centrioles instead they have its analogous regions from which spindle microtubules radiate.
Animal cell shape changes.	Plant cell shape does not change greatly because it is surrounded by a rigid cell wall.

In animals, cytokinesis occurs by forming a contractile ring which splits the cell in to two.	In plants at cytokinesis, vesicles from Golgi complex form Phragmoplast. These vesicles originate actually during metaphase, line up in the in the center of the dividing, where they fuse to form the Phragmoplast at the end of the telophase. The membrane vesicles become the plasma membrane of daughter cells. These vesicles contain precursor of cellulose and pectin for future cell wall.
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23. How meiosis plays its role in producing genetic variations? (LB-2019)

**Ans:**

- Crossing over results in a large number of recombination's.
- Random assortment during anaphase gives a wide range of variety of gametes.
- Both crossing over and random assortment cause variations and modifications in the genome. These variations are not only the bases of evolution but also make every individual specific, particular, and unique in his characteristics. Even the progeny (offspring's) of same parents i.e., brothers and sisters are not identical to each other.

24. Briefly explain prophase in mitosis. (LB-2021)

**Ans: Prophase:**

- At the beginning of prophase, the chromatin material gets condensed by folding and the chromosomes appear as thin threads (0.25 $\mu$ m - 50 $\mu$ m in length).
- Chromosomes become more and more thick ultimately each chromosome is visible having two sister chromatids, attached at centromere.
- Towards the end of prophase, nuclear envelope disappears, and nuclear material is released in the cytoplasm, nucleoli disappear.
- Mitotic apparatus is organized.
- Cytoplasm becomes more viscous.

25. How malignant tumor or cancer is caused? (LB-2021)

**Ans: Cause of Malignant Tumors / Cancer:**

Cancer is caused mainly by mutations in somatic cells. Secondly, the cancer results from the accumulation of as few as three to as many as twenty mutations, in genes that regulate cell division. These mutations bring two basic changes in the cancer cells.

- First, the metastatic cells break their contact with other cells and overcome the restrictions on cell movement provided by basal lamina and other barriers, ultimately metastatic cells can invade other parts of the body.
- Secondly, they proliferate, unlimitedly, without considering the checks or programmes of the body.

**FORMAN CHRISTIAN COLLEGE (A Chartered University)**  
**QUESTION BANK PART II BIOLOGY**

**Chapter 22**

Short questions:

1. What is Bombay phenotype? (LB-2016, 2017)

Bombay Phenotype: Some persons may be genotypically of blood type A, B or AB but phenotypically of blood type, O. Such a phenotype is called Bombay Phenotype. These persons lack a glycoprotein which helps A and B antigen to adhere on RBCs

2. What is MODY? (LB-2008, 2015, 2016)

MODY: It stands for Maturity Onset Diabetes of the Young. It is an autosomal dominant trait. It is caused by mutation in gene for glucokinase enzyme, which converts glucose to glucose-6-phosphate, in pancreas.

3. What is SRY gene? How it is transferred? (LB-2011)

SRY Gene: In human beings, SRY is the male determining gene. It is located at the tip of short arm of Y chromosome. Its name SRY stands for Sex determining Regions of Y. It is male sex switch which triggers the developmental process towards maleness after 6 week pregnancy.

4. What are the genes and alleles? (LB-2016)

Gene: gene is the basic unit of biological information. It is a particular sequence of DNA nucleotides on a chromosome that encodes a protein, tRNA to rRNA molecules.

Allele: The partners of a gene pair are called alleles. They occupy same gene locus. Both alleles may be identical or different from each other.

5. What is a nullo gamete?

A gamete without any sex chromosome is called nullo gamete.

6. What do you know about hypophosphatemic rickets?

X-linked dominant inheritance: X. linked dominant traits are more common in female than in males. All the daughters of an affected father, but none of his sons are affected. Any heterozygous affected mother will pass the trait equally to half of her sons and half of her daughters. Example, Hypophosphatemic rickets

7. What is testicular feminization syndrome?

Testicular Feminization Syndrome: It is a rare x-linked recessive trait. Individuals have XY chromosomes but tfm gene on their X-chromosome develops them physically into females. They have breast, female genitalia, a blind vagina but no uterus. They are happily married as females but are sterile.

8. What are pseudoautosomal genes?

Pseudo autosomal traits: Genes of some traits are present on both X and Y chromosomes. These are called X- and Y-linked genes. These are also called pseudo autosomal genes / traits because their pattern of inheritance is like autosomal genes/traits.

9. What is haemophilia?

Haemophilia is a mostly inherited genetic disorder that impairs the body's ability to make blood clots, a process needed to stop bleeding.

10. What is the role of blood groups in establishing parentage? (LB-2010)

The blood groups are controlled by genes and these genes start their expression at early embryonic stage and keep on expressing themselves till death. Therefore the blood group phenotype of a person never changes.

11. What is meant by universal blood donor and universal recipient?

Universal Blood Donors: A person with blood group O can donate blood to persons with blood group O. But phenotype O can also be used as donor for small transfusion to A, B and AB recipients, because donor's antibodies are quickly absorbed by other tissues or greatly diluted in recipient's blood stream. As they can donate to all groups (A,B,AB,O), so are called universal donors. While AB+ is universal recipient.

12. What are X-linked and Y-linked genes? Give one example of both.

X-linked A trait whose gene is present on X-chromosome only is called X-linked or sex-linked trait. X-linked traits pass in a criss-cross fashion from maternal grandfather through his daughter to the grandson e.g. hemophilia, color-blindness.

Y-linked traits: Y-chromosome also carries few genes which have no counterpart on X-chromosome. Such genes are called Y-linked genes and their traits are called Y-linked traits. These traits directly pass through Y-chromosome from father to son only e.g. SRY gene for maleness.

13. What is crossing over? What is its importance? (LB-2013)

Crossing over: is an exchange of segments between non-sister chromatids of homologous chromosomes during meiosis. Crossing over produces genetic variations among offspring and provides raw material for evolution.

14. What is bean-bag genetics? (OR) What is a gene pool? (OR) Differentiate between gene and gene pool. (LB-2014)

Gene pool: All the gene/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.

15. What is meant by erythroblastosis foetalis? (OR) Why erythroblastosis foetalis is called so? (OR) How does ABO incompatibility protect the developing baby against Rh-incompatibility? (LB-2011, 2012)



Protection of baby against Rh-incompatibility:

- The blood of such babies should be immediately replaced by Rh-ve blood free of Anti-Rh antibodies.
- To avoid Rh-incompatibility for the next foetus, mother is given an injection of Rh-antiserum immediately after birth and during early pregnancy.

16. What is meant by linkage, linked genes and linkage groups? (OR) What is a linkage group? (OR) Define linkage group by giving example. (OR) What are linkage groups? Give their number in human beings. (OR) Define gene linkage and gene linkage groups (LB-2018, 2021)

Gene Linkage: All the genes located on the same chromosome are linked to each other. This phenomenon of staying together all the genes of a chromosome is called gene linkage. e.g. man has 23 linkage groups. Linked genes do not obey the law of independent assortment.

17. What is test cross? Why did Mendel suggest this cross? (OR) Give the significance of test cross. (OR)

What is test cross? Give its uses. (LB-2011, 2012, 2013, 2018)

Test cross: It is a mating in which an individual showing a dominant phenotype is crossed with an individual showing its recessive phenotype. The test- cross finds out the homozygous or heterozygous nature of the genotype.

18. What is the difference between heterogametic and homogametic individuals? (OR) What is heterogametic individual? Give example. (LB-2018)

Homogametic: Individuals which produce only one type of gametes are called homogametic e.g. in human, and birds females are homogametic because they produce only one type of eggs all carrying X-chromosome along with autosomes.

Heterogametic: Individuals which produce two types of gametes are called heterogametic e.g. In humans, males are heterogametic as they produce two types of sperms half with X-chromosome and half carrying Y-chromosome along with autosomes.

19. What are compound sex chromosomes and their example? (LB-2013)

Sex-Chromosome: Chromosomes which are different in males and females of a species with reference to number of chromosomes or morphology of chromosome are called sex-chromosome e.g. in humans, females have XX and males have XY.

20. Compare monohybrids with dihybrids. (LB-2021, 2015)

Monohybrid: A cross between the individuals of the same species, considering one pair of contrasting trait is called monohybrid cross. e.g. cross between a tall and short pea plant.

Dihybrid: A cross between the individuals of the same species considering two pairs of contrasting traits is called a dihybrid cross. e.g. cross between a Round Yellow seeded and wrinkled green seeded pea plants.

21. Define laws of Mendel. (OR) Define Mendel's law of segregation (law of purity of gametes). (OR) Define law of segregation. (LB-2015, 2018)

Law of Segregation: According to this law, the two co-existing alleles of each trait in an individual segregate 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.

22. Differentiate between phenotype and genotype. (OR) What is the difference between phenotype and genotype? (LB-2014)

Phenotype: The physical appearance of an individual for a trait is called phenotype e.g. tallness, seed color of pea plants.

Genotype: The genetic complement or genes in an individual for a particular trait e.g. TT or Tt for pea plant height.

23. Differentiate between incomplete dominance and co-dominance. (LB-2012)

Incomplete Dominance: When the phenotype of the heterozygote is intermediate between the phenotype of the two homozygotes, it is called incomplete dominance e.g. in 4,O, clock plants when red (R<sub>1</sub>R<sub>1</sub>) and white (R<sub>2</sub>R<sub>2</sub>) are crossed, an intermediate pink flower (R<sub>1</sub>R<sub>2</sub>) is produced.

Co-Dominance: Co-dominance occurs when both the alleles express independently in heterozygote and form the respective products. e.g. in ABO blood group system Allele I<sup>A</sup> and I<sup>B</sup> are co-dominant.

24. Differentiate between autosomes and sex-chromosomes. (LB-2019)

Autosomes: Any eukaryotic chromosome other than sex chromosome is called autosomes. Autosomes are present in the same number and kind in both males and females of the species e.g. human have 44 autosomes in 22 pairs

Sex-Chromosome: Chromosomes which are different in males and females of a species with reference to number of chromosomes or morphology of chromosome are called sex-chromosome e.g. in humans, females have XX and males have XY.

25. Differentiate between gene and genome.

Gene: gene is the basic unit of biological information. It is a particular sequence of DNA nucleotides on a chromosome that encodes a protein, tRNA to rRNA molecules.

Genome: The genetic material of an organism is called genome.

26. Differentiate between homozygous and hemizygous.

Homozygous /True Breeding: The individual having two identical alleles of the same gene e.g. for a locus W the genotype W/W or w/w is a homozygous condition.

Hemizygous: Individuals carrying only one allele for a trait are called hemizygous. e.g. allele for hemophilia in human is located on X-chromosome. Males have only one X-chromosome thus have only one allele. So human males are hemizygous for hemophilia.

27. Differentiate between homozygous and heterozygous. (LB-2011, 2014, 2016)

Homozygous /True Breeding: The individual having two identical alleles of the same gene e.g. for a locus W the genotype W/W or w/w is a homozygous condition.

Heterozygous: The individual having two different alleles of the same gene e.g. for a locus W, the genotype W/w is a heterozygous condition.

28. Differentiate between dominant trait and recessive trait.

Dominant Trait/Allele: An allele that is expressed both in heterozygous and homozygous condition, is called dominant allele. e.g Pea plant height.

Recessive allele: An allele that is expressed only in homozygous form, but in heterozygous form it is masked by the other allele and does not express itself is called recessive allele e.g dwarfness in pea plant.

29. Differentiate between X-linked and Y-linked traits.

X-linked / sex-linked traits: A trait whose gene is present on X-chromosome only is called X-linked or sex-linked trait. X-linked traits pass in a criss-cross fashion from maternal grandfather through his daughter to the grandson e.g. hemophilia, color-blindness

Y-linked traits: Y-chromosome also carries few genes which have no counterpart on X-chromosome. Such genes are called Y-linked genes and their traits are called Y-linked traits. These traits directly pass through Y-chromosome from father to son only e.g. SRY gene for maleness.

30. Differentiate between X-linked dominant and X-linked recessive traits. (LHR- 2021)

X-linked dominant inheritance: X-linked dominant traits are more common in female than in males. All the daughters of an affected father, but none of his sons are affected. Any heterozygous affected mother will pass the trait equally to half of her sons and half of her daughters. Example, Hypophosphatemic rickets

Hemophilia is an X-linked recessive trait. These are always more common in males than in females.

31. Differentiate between IDDM and NIDDM.

IDDM: It stands for Insulin Dependent Diabetes Mellitus. It is diabetes type I disease. It is a multifactorial disease in which body's own immune system destroy Beta-cells of pancreas. So pancreas does not produce insulin. Diabetics of type I must receive exogenous insulin. It is also called juvenile diabetes as it onsets before 40.

NIDDM: It stands for Non-Insulin Dependent Diabetes Mellitus. It is also called Diabetes type II. These produce endogenous insulin but their body cells do not respond to insulin, and do not take up glucose from blood. It mostly occurs over the age of 40 but some may get before 25 as in case of MODY.

32. Differentiate between multifactorial and polygenic traits.

Multi factorial Trait: Such traits which are controlled by polygenes and also show environmental influences on its expression e.g. blood pressure, diabetes, etc.

A polygenic trait is one whose phenotype is influenced by more than one gene.

33. Differentiate between probability and product rule. (LB-2008)

Probability: is the chance of an event to occur. e.g. in Mendel's monohybrid cross, the chance of Round seed in F<sub>2</sub> was  $\frac{3}{4}$  and that of wrinkled seed was  $\frac{1}{4}$ .

Product Rule: When two independent events are occurring simultaneously like in dihybrid cross, the ratio of each joint phenotypic can be obtained by multiplying the probabilities of individual phenotypes. It is called the product rule.

e.g	Round	Yellow	Round Yellow
	3/4	3 / 4	(3/4 x 3/4) = 9/16

34. Differentiate between protanopia, deuteranopia and tritanopia.

Protanopia is a deficiency in colour vision in which those affected are insensitive to red light and confuse red, yellow, and green colours.

deuteranopia is a form of color blindness in which the retina is deficient in or lacks cone cells containing opsins that respond to the color green, resulting in an inability to distinguish red from green.

tritanopia in contrary to red-green color blindness tritan defects are autosomal and encoded on chromosome 7.

35. Differentiate between allele and multiple alleles? (OR) What are multiple alleles? Give example. (LB- 2014)

Allele: The partners of a gene pair are called alleles. They occupy same gene locus. Both alleles may be identical or different from each other.

Multiple alleles: When there exists more than two alternate forms of a gene, it is called multiple alleles. Such forms arise by gene mutations.

36. Differentiate between dominance and epistasis. (OR) What is epistasis? How it differs from dominance? (LB-2010, 2012, 2018)

Dominance: Dominance is physiological effect of an allele over its partner allele on the same gene locus. e.g gene for round seed shape is dominant over wrinkled seed shape.

Epistasis: (LHR-2010). When an effect caused by a gene or gene pair at one locus interferes with or hides the effect caused by another gene or gene pair at another locus, such a phenomenon of gene interaction is called epistasis. e.g Bombay phenotype

37. Differentiate between sex-limited and sex-influenced traits. (OR) What are sex-limited traits? (OR) What are sex-influenced traits? (OR) What is the sex-limited traits? Give an example. (LB-2008, 2009, 2013, 2017, 2018)

Sex limited trait: A sex limited trait is limited to only one sex due to anatomical differences either in males or in females e.g. milk yield in dairy cows, beard growth in men. (RWP-2008)

Sex influenced trait: Sex influenced trait occurs in both males and females but it is more common in one sex. It is controlled by an allele which is dominant in one sex and recessive in other due to hormonal differences. e.g. pattern baldness in humans.

38. Distinguish between polygenes and pleiotropy. (OR) Define pleiotropy. (OR) What is pleiotropy and its example? (LB-2013)

Pleiotropy: When a single gene affects two or more traits, the phenomenon is called pleiotropy e.g. genes that affect growth rate in human also influence both weight and height.

39. Give the concept of fixed allele. (LB-2012)

A fixed allele is an allele that is the only variant that exists for that gene in all the population. A fixed allele is homozygous for all members of the population. The term allele normally refers to one variant gene out of several possible for a particular locus in the DNA.

40. The value of parental combination of two linked gene AB and ab is 40, 40 and of recombinant gene Ab and aB is 10, 10 respectively. Find recombination frequency. (LB-2010)

It is the proportion of recombinant types between two gene pairs as compared to the sum of all combinations

$$\begin{aligned} \text{Recombination Frequency} &= \frac{\text{Recombination types}}{\text{Sum of all combinations}} \times 100 \\ \text{Recombination Frequency} &= \frac{10+10}{(40+40+10+10)} \times 100 \\ &= 20\% \end{aligned}$$

41. How is blood pressure as a multifactorial trait? (LB-2019)

Blood pressure is a multifactorial trait.

There is a correlation between systolic and diastolic blood pressure of parents and their children. This correlation is due to genes common in them. .

Environmental factors like diet, stress and tension also influence the blood pressure. That's why blood pressure a multifactorial trait.

42. Write formula to calculate recombination frequency. (LB-2019)

Cross Over or Recombination Frequency:

The proportion of recombinant types between two gene pairs as compared the sum of all combinations is called cross over or recombination frequency:

## Chapter 23

Short questions:

1. What is a probe? (LB-2014)

Probe: A probe is a single stranded DNA nucleotide sequence that will hybridize with certain pieces of DNA. Location of the probe is possible to locate because the probe is either radio active or fluorescent. These may be used to find out a particular gene in genomic library

2. What is gene pharming? (LB-2018)

The use of genetic engineering to insert genes that code for useful pharmaceuticals into host animals or plants that would otherwise not express those genes, thus creating a genetically modified organism (GMO)

3. What is aspartame?

Aspartame: It is a Dipeptide sweetener known as NutraSweet. It is made from Phenylalanine. This phenylalanine can be obtained from transgenic bacteria.

4. What is gene therapy?

Gene Therapy: It is the insertion of genetic material into human cells for the treatment of a disorder. e.g. against cystic fibrosis, cancer, hemophilia. It has two main methods.

- Ex-vivo.
- In-vivo.

5. What is cystic fibrosis?

Cystic Fibrosis:- It is a hereditary disease in which the patients lack a gene that codes for Trans-membrane carrier of the chloride ions. The patient dies due to infection in respiratory tract. It may be cured by in-vivo gene-therapy.

6. What is meant by cloning? (LB-2010)

Cloning is the process of producing genetically identical individuals of an organism either naturally or artificially. In nature, many organisms produce clones through asexual reproduction. Cloning in biotechnology refers to the process of creating clones of organisms or copies of cells or DNA fragments.

7. What are Palindromic sequences? (LB-2018, 2021)

Palindromic sequence: It is the sequence of four or six nucleotides in a DNA duplex arranged symmetrically in the reverse order. The bacterial restriction enzymes cut DNA at these specific sites or sequence. These sites are called palindromic sequences.

Example  
G C T C A A T T G C T C  
C G A G T T A A C G A G

8. What are the various methods of gene or DNA sequencing? (LB-2016)

Sanger sequencing is a method of DNA sequencing first commercialized by Applied Biosystems, based on the selective incorporation of chain-terminating dideoxynucleotides by DNA polymerase during in vitro DNA replication.

Maxam–Gilbert sequencing is a method of DNA sequencing developed by Allan Maxam and Walter Gilbert in 1977–1980. This method is based on nucleobase-specific partial chemical

modification of DNA and subsequent cleavage of the DNA backbone at sites adjacent to the modified nucleotides.

9. What are the two goals of Human Genome Project? (LB-2016, 2018)

One goal of the project was to accurately sequence the 3 billion nucleotide base pairs in the human genome. A second goal was to map and identify all of the human genes present in the DNA sequence.

10. What is the biodegradable plastic and its origin? (LB-2013)

Biodegradable plastic: It is chemically a polyhydroxy- butyrate. A weed called mouse eared cress has been engineered to produce this biodegradable plastic.

11. What is SCID?

It is abbreviation of Severe Combined Immunodeficiency Syndrome. In this disease the children lack an enzyme Adenosine deaminase that is involved in the maturation of T and B lymphocytes. These children are subjected to life threatening infections. This disease can be treated by ex-vivo gene therapy.

12. What is the role of suicide gene in transgenic bacteria? (LB-2013)

Suicide Gene: Some bacteria were made transgenic to clean up the levels of toxins that would have killed other strains. Further these bacteria were given suicide genes that caused them to self destruct when the job had been accomplished.

13. What is the advantage of genetic engineering of C4 plants?

Plants that perform C4 photosynthesis can keep their stomata closed more than their C3 equivalents because they are more efficient in incorporation CO<sub>2</sub>. This minimizes their water loss.

14. What are transgenic plants. (OR) Give two advantages of transgenic plants. (LB-2011, 2014, 2015)

Transgenic plants are plants that have been genetically engineered, a breeding approach that uses recombinant DNA techniques to create plants with new characteristics. They are identified as a class of genetically modified organism (GMO).

15. What is Ex-vivo gene therapy? (OR) Differentiate between Ex-vivo and In-vivo gene therapy. (LB- 2016, 2017)

In contrast, in vivo work is that which is conducted with living organisms in their normal, intact state, while ex vivo studies are conducted on functional organs that have been removed from the intact organism.

16. What is a genome and genomic library? (OR) Differentiate between genome and genomic library. (OR)

Define genomic library. (LB-2016, 2018)

Genomic Library: A genomic library is a collection of bacterial or bacteriophage clones, each clone containing a particular segment of DNA from the source cell. A probe is used to locate the gene from the collection.

**Making Genomic Library:** For making genomic library an organism's DNA is sliced up into pieces and pieces are put into vectors (plasmid or virus), which are taken up by host bacteria. The entire collection of bacterial or bacteriophage clones contain all the genes of that organism.

17. What is PCR and write applications of PCR amplification. (OR) What are the uses of PCR amplification and analysis? (LB-2013)

PCR: A process by which DNA polymerase enzyme is used to copy a DNA sequence of interest repeatedly, making millions of copies of the same DNA in a test tube. In this process primers are also added. DNA-polymerase used in PCR is extracted from *Thermus aquaticus* bacterium which lives in hot springs.

18. What is totipotency? (OR) What is totipotent cell? (OR) Define the term totipotent. (OR) Why plant cells are said to be totipotent? (LB-2014, 2017)

Totipotent:- It means that each plant cell has the full genetic potential of the organism and therefore a single cell could become a complete organism.

19. Define biotechnology. Give its application. (LB-2016)

Biotechnology: is the use of a natural biological system to produce a product or to achieve an end product desired by human.

Uses of Biotechnology:

- To obtain drugs as insulin, vaccines, antibodies, interferons etc.
- To clean up environmental pollutants.
- To kill insect pests.
- To increase soil fertility.
- Gene therapy in humans etc.

20. Define Molecular scissors. (OR) What are restriction enzymes? Give example. (OR) Differentiate between molecular scissors and molecular vectors? (LB-2009, 2018)

Restriction Enzymes: These are natural enzymes of bacteria, which they use for their own protection against viruses. They cut down viral DNA. These enzymes can be isolated and used in biotechnology to cut the gene of interest. e. g EcoR1

21. What is the role of molecular carrier-the vector? (OR (LB-2012, 2013, 2014, 2017)

A plasmid is a small DNA molecule within a cell that is physically separated from chromosomal DNA and can replicate independently. They are most commonly found as small circular, double-stranded DNA molecules in bacteria

22. Explain the importance of gene sequencing. (LB-2010)

DNA sequencing is important to apply to the human genome. It allows scientists to sequence genes and genomes. Since there is a limit to how many bases can be sequenced in one experiment, larger DNA molecules - as mentioned - have to be 'broken' into smaller fragments before they can be sequenced and reassembled



23. Give the process of coronary artery 'angioplasty' briefly, using biotechnology. (LB-2021)

**Coronary Artery Angioplasty:**

During coronary artery angioplasty, a balloon catheter is sometimes used to open up a closed artery:

Unfortunately the artery has a tendency to close up once again, so investigators have come up with a new procedure.

**Coronary Artery Gene-Therapy:**

In this method the balloon is coated with a plasmid that contains a gene for vascular endothelial growth factor.

The expression of the gene promotes the proliferation of the blood vessels bypassing the obstructed area. It has been observed in at least one patient.

24. Give any two requirements to produce recombinant DNA. (LB- 2019)

In order to produce recombinant DNA, following materials are required:

1. **Gene of interest:** which is to be cloned. e.g. Gene of insulin
2. **Molecular scissors:** to cut out the gene of interest, e.g, restriction endonuclease enzymes
3. **Molecular carrier or vector:** on which gene of interest could be placed, e.g, plasmid bacteriophage etc.
4. **Expression system:** the gene of interest along with the vector is then introduced into an expression system, as a result of which a specific product is made, e.g, bacterial cell.

25. What are protoplasts? Give scientific name of biodegradable plastic. (LB-2021)

**Protoplasts:**

Plant cells whose cell wall has been removed is called protoplast. Protoplasts can be used to introduce genes into the cells.

**Bio-degradable plastic:** Its scientific name is *polyhydroxybutyrate*.

# FOMAN CHRISTIAN COLLEGE

(A Chartered University)

## QUESTION BANK PART II BIOLOGY

### Chapter 24

#### Short questions:

1. What is genetic drift? (LB-2010, 2011, 2012, 2021)

**Genetic Drift:** The changes in frequency of alleles at a locus by chance are called genetic drift. Actually it is the disappearance of particular genes from the population.

**Effect of Genetic Drift on Population:**

- In small populations, fluctuation may lead to the loss of particular alleles.
- It occurs in a small population when few individual fail to reproduce. Thus the genes are lost from population.

2. What are hydrothermal vents? How do they support life?

**Hydrothermal vents:** Hot springs present in underwater in the deep oceans are called hydrothermal vents. These are supposed to have provided energy and raw material for beginning of life on earth.

3. What are modern synthesis/ Neo-Darwinism? **(OR)** Give the concept of Neo-Darwinism. (LB-2012, 2014)

**Neo-Darwinism:** The theory of evolution as proposed by Darwin has been modified in the light of modern evidences of genetics, molecular biology, paleontology, cytology, ecology and is known as neo-Darwinism or synthetic theory of evolution.

4. Write the name of theories of evolution presented by Lamarck and Darwin. (LB-2011)

**Lamarckism:** According to Lamarck. **Inheritance of Acquired Characters**

- The parts of the body used extensively become large and stronger(long neck of giraffe), while those not used, deteriorate with passage of time(loss of legs in snakes)
- These acquired characters passed along to the offspring.

Lamarck's second point was disproved experimentally.

Darwin gave **The origin of Species**

- Descent with modification
- Natural selection and modification

5. What are vestigial organs? Name some important vestigial organs of man. **(OR)** What are vestigial organs? Give one example (LB-2010, 2012, 2014, 2018)

**Vestigial organs:** Vestigial organs are historical remnants of structures that had important functions in ancestors but no longer essential presently. e.g. appendix in carnivores, ear muscles in man are the vestigial organs.

6. Define the term Neo-Darwinism. (LB-2018)

**Neo-Darwinism:** The theory of evolution as proposed by Darwin has been modified in the light of modern evidences of genetics, molecular biology, paleontology, cytology, ecology and is known as neo-Darwinism or synthetic theory of evolution.

7. Define fossil. Where are most of the fossils found? (LB-2014)

**Fossils:** The fossils are either actual remains or traces of organisms or impressions or cast made by the body parts

of organisms that lived in ancient times. Fossils help in studying evolution.

8. Define endosymbiont hypothesis.

**Endosymbiont Hypothesis:** This hypothesis was proposed by Margulies. According to this hypothesis a photosynthetic, aerobic, eukaryotic organism might have evolved when a large anaerobic prokaryotic amoeboid ingested a small aerobic bacteria and stabilized it, so it became a mitochondrion, and when it ingested a cyanobacterium and stabilized it, it became a chloroplast and when it ingested a spirochete bacterium and stabilized it, it became a flagellum.

9. Define endangered species. **(OR)** What are endangered species? Give examples. **(OR)** Differentiate between endangered and threatened species. (LB-2018)

**Endangered Species:** An endangered species is in imminent danger of extinction throughout its range.

**Threatened Species:** A threatened species is likely to become endangered in the near future.

10. Define Hardy Weinberg Theorem and give its equation in the form of binomial expansion. (LB-2013)

**Hardy-Weinberg Theorem:** It states that the frequency of alleles and genotypes in a population's gene pool remain constant over the generations unless acted upon by agents other than sexual recombination. So shuffling of alleles due to meiosis and random fertilization has no effect on the overall genetic structure of a population.

11. Differentiate between homology and analogy. (LB-2013)

**Homology:** Similarity in characteristics resulting from common ancestry is known as homology and these similar anatomical structures are known as homologous structures. e.g. forelimbs of man, bat, horse, whale, etc have same internal structure showing their common ancestry.

**Analogy:** The presence of analogous organs is termed as analogy. Organs which are functionally alike but structurally different are called analogous organs.

12. Differentiate between homologous and analogous organs. **(OR)** Define homologous organs by giving examples (LB-2011, 2012)

Homologous Organ	Analogous Organ
<ul style="list-style-type: none"> <li>• Homologous organs are functionally different but structurally alike.</li> <li>• Homologous organs show divergent evolution.</li> <li>• Homologous organs have common evolutionary origin.</li> <li>• <b>Example:</b> The arms, wings flippers and forelegs of different vertebrates are homologous organs.</li> </ul>	<ul style="list-style-type: none"> <li>• Analogous organs are functionally alike but structurally different.</li> <li>• Analogous organs show convergent evolution.</li> <li>• Analogous organs do not have common evolutionary origin.</li> <li>• <b>Example:</b> Wings of birds and wings of insects.</li> </ul>

13. Name any four factors affecting gene frequency. (LB-2013)

**Factors affecting the gene frequency:** These are

- Mutation
- Migration
- Genetic drift
- Non-random mating

14. State/define theory of special creation. (LB-2014)

**Theory of special Creation:** According to this theory all living things came into existence in their present forms especially and specifically created by nature. The persons of this thought are called creationists.

15. What is membrane invagination hypothesis? (LB-2019)

- According to this hypothesis, the prokaryotic cell membrane invaginated
- It enclosed the copies of its genetic material in the invagination.
- Several double membrane bound entities (organelles) were formed by this invagination in a single cell.
- These entities then changed into the eukaryotic mitochondria, nucleus, chloroplast etc.

16. What is Hardy-Weinberg Theorem? (LB-2019)

It states that “the frequencies of alleles and genotypes in a population’s gene pool remain constant over the generations unless acted upon by agents other than sexual recombination”. OR

“Under certain conditions of stability both allelic frequencies and genotypic ratio remain constant from generation in sexually reproducing organism”.

- In fact the Hardy- Weinberg equation is a binomial expression

$$(P+q)^2 = P^2 + 2Pq + q^2$$

17. Differentiate between homologous and analogous organs. (LB-2021)

Homologous Organ	Analogous Organ
<ul style="list-style-type: none"><li>• Homologous organs are functionally different but structurally alike.</li><li>• Homologous organs show divergent evolution.</li><li>• Homologous organs have common evolutionary origin.</li><li>• <b>Example:</b> The arms, wings flippers and forelegs of different vertebrates are homologous organs.</li></ul>	<ul style="list-style-type: none"><li>• Analogous organs are functionally alike but structurally different.</li><li>• Analogous organs show convergent evolution.</li><li>• Analogous organs do not have common evolutionary origin.</li><li>• <b>Example:</b> Wings of birds and wings of insects.</li></ul>

## Chapter 25

### Short questions:

1. What is ammonification? (LB-2010)

**Ammonification:** The soil-dwelling decomposers like bacteria and fungi use amino acids, proteins, nucleic acid and nucleotides from debris and release excess amount of ammonia and ammonium ions. This process is called as Ammonification.

2. What are root nodules? (LB-2017)

**Root Nodules:** The legume plants (peas, and beans) are the hosts to bacteria which inhabit the roots forming root nodules. The bacteria in the root nodules fix atmospheric nitrogen and plant provides bacteria with food and protection.

3. What is assimilation? (LB-2014)

**Assimilation:** The plants when absorb nitrogen from soil, it is used up to produce amino-acids, proteins and nucleic acid and other organic compounds. This is known as assimilation.

4. What is a Mycorrhiza? (OR) What are Mycorrhizae? (LB-2009, 2011)

**Mycorrhizae:** is symbiotic association between the roots of plants growing in acidic soil and certain fungi. The host provides the fungus with an enzyme to digest carbohydrates in leaf litter. In return the fungus passes mineral ions from soil to the host.

5. What are lichens? (LB-2008)

**Lichens:** Lichen is a dual organism composed of symbiotic, mutualistic association of an alga living within a fungus mycelium. The lichens may grow on exposed rock surface and are important colonizers of bare ground.

1. What is grazing? How grazing affect the texture of soil? (OR) Define grazing. How grazers affect the ecosystem? (LB-2008, 2010)

**Ans:**

**Grazing:** Many animals like rabbits, goats, sheep, cows, buffaloes and horses feed and graze on grasses. This mode of feeding is called grazing. These animals live in pasture land where they feed on grasses, herbs and shrubs. The overgrazing may result in barren-land.

2. What is biome? (OR) Differentiate between biome and biosphere?

**Biome:** Major types of ecosystems, which occupy broad geographical regions are called biomes. A biome consists of a fully developed climax community e.g. grass-lands, forests.

**Biosphere:** is a thin layer of earth in which all living organisms live. It is a combination of all the biomes of earth together forming a planetary ecosystem. It extends 8-10 km. to upper atmosphere and 8-10 km. into the depths of ocean.

3. Briefly write about secondary succession. (LB-2012)

**Secondary Succession:** Succession is a community relay in which a community replaces the earlier. During secondary succession, a new ecosystem develops after an existing ecosystem is disturbed, as in case of forced fire or an abandoned farmland. It happens much more rapidly because the previous community has left its marks in the form of improved soil and seeds.

4. Define predation. **(OR)** Give the significance of predation. (LB-2012, 2016)

**Predation:** An animal that preys on other animals is called as **predator**. So the predator is a tertiary or secondary consumer or a carnivore. The animal that is caught and eaten is called as **prey**. The over all process is called as predation e.g. cat/mouse, fox/rabbit.

5. Define succession and name its types. (LB-2014)

**Succession:** is a kind of community relay in which assemblages of plants and animals replace the earlier ones, in a sequence that is at least somewhat predictable. Succession is initiated by a few hardy invaders called pioneers and it ends with a diverse and stable climax community.

**Primary Succession:** Succession is a community relay in which a community replaces the earlier. During primary succession an ecosystem is forged from bare rock or a clear glacial pool, where there is no trace of previous life. It is very slow in working.

**Secondary Succession:** Succession is a community relay in which a community replaces the earlier. During secondary succession, a new ecosystem develops after an existing ecosystem is disturbed, as in case of forced fire or an abandoned farmland. It happens much more rapidly because the previous community has left its marks in the form of improved soil and seeds.

6. Define biogeochemical cycles. **(OR)** What are biogeochemical cycles? (LB-2012)

**Bio-Geo-Chemical Cycles:** The nutrient cycles are also called Biogeochemical cycles because the nutrients move from living to non-living to living portions of ecosystem in a cyclic manner e.g. carbon cycle, Nitrogen cycle.

7. Define productivity of an ecosystem (LB-2008)

**Productivity:** Can be defined as the rate of production of new biomass during a specific period. Productivity is generally expressed in terms of grams or Kilocalories per square meter. The productivity can be indicated by consumption of CO<sub>2</sub> and evolution of oxygen in the process of photosynthesis.

8. Define ecosystem. Write its components. **(OR)** Define ecosystem. (LB-2012, 2016, 2019)

**Ecosystem:** Eco means the environment and system means a collection of related parts that function as a unit. So it can be defined as.

A natural area where living organisms and physical environment interact and exchange materials between them so as to achieve functional stability is known as ecosystem e.g. forest ecosystem, a pond ecosystem.

9. Define biosphere. **(OR)** What is biosphere. **(OR)** Define biosphere and ecosystem. (LB-2014, 2015, 2018, 2019)

**Biosphere:** is a thin layer of earth in which all living organisms live. It is a combination of all the biomes of earth together forming a planetary ecosystem. It extends 8-10 km. to upper atmosphere and 8-10 km. into the depths of ocean.

**Ecosystem:** Eco means the environment and system means a collection of related parts that function as a unit. So it can be defined as.

A natural area where living organisms and physical environment interact and exchange materials between them so as to achieve functional stability is known as ecosystem e.g. forest ecosystem, a pond ecosystem.

10. Define and describe biotic components of an ecosystem. (LB-2014)

**Biotic Components:** Include all living organisms of an ecosystem. These include

(a) **Plants:** Which produce food by photosynthesis.

(b) **Animals:** Which consume the produced food.

(c) **Bacteria and Fungi:** which decompose the organic materials.

11. Define parasitism. Give its significance. **(OR)** Differentiate between predation and parasitism. (LB-2009, 2012, 2019, 2021)

**Predation:** An animal that preys on other animals is called as **predator**. So the predator is a tertiary or secondary consumer or a carnivore. The animal that is caught and eaten is called as **prey**. The over all process is

called as predation e.g. cat/mouse, fox/rabbit.

**Parasitism:** This is an association between a host and a parasite, which involves providing the parasite, with food, protection and conditions for its survival. The parasite may or may not harm the host. The parasites are of two types.

- Ecto-parasites: The parasite which live outside the body of the host is known as ectoparasite e.g. fungi causing dandruff.
- Endo-parasites: The parasite which live inside the body of host known as Endoparasite e.g. tape worm in intestine of man.

12. Define commensalism. Give one example. **(OR)** Define commensalism with the help of an example. (LB-2013, 2018)

**Commensalism:** It is the type of relationship in which two organisms live together, but only one organism gets benefit from the relationship, the other is not affected at all e.g. shark and remoras fish. As shark feeds, the remoras pick up the scrap. The remoras benefit this relationship and shark is not affected.

13. Define food chain and food web. **(OR)** Define food chain by giving an example. (LB-2010, 2012, 2013, 2015, 2019, 2021)

**Food Chain:** (LHR-2010) is the transfer of food energy from the source in plants through a series of organism with repeated stages of eating and being eaten e.g

Producers \_\_\_\_ herbivores \_\_\_\_ carnivores \_\_\_\_ Decomposers.

grass \_\_\_\_ grasshoppers \_\_\_\_ lizards \_\_\_\_ snakes \_\_\_\_ hawk.

**Food web:** (LHR-2010) is a complex pattern of several interlocking food-chains in a complex community or between several communities.

All the food chains and food webs begin with a green plant and may consist of three to five trophic levels.

14. Differentiate between population and community. (LB-2014)

**Population:** is a group of interbreeding individuals (same species) occurring together in space and time e.g. population of human beings in Lahore in 1990.

**Community:** All the populations with in an ecosystem are known as a community and are in one or another manner interconnected to one another e.g. all the producers, consumers and decomposers of a pond ecosystem constitute a community.

15. Differentiate between habitat and niche. **(OR)** Define niche. **(OR)** Explain ecological niche. (LB-2011, 2012, 2013)

**Habitat:** An organism responds to a variety of environmental factors. When all these factors are with in the range of tolerance, the organism can inhabit the location. So the actual location of a place where an organism lives is called its habitat.

**Ecological Niche:** It can be defined as the role that a species plays in a community including behavior and influence.

16. Differentiate between autecology and synecology. **(OR)** What is synecology? **(OR)** What is autecology? (LB-2011, 2013, 2018,2019)

<b>Autecology</b>	<b>Synecology</b>
<ul style="list-style-type: none"><li>• The study of relationship of a single population to its environment is called autecology.</li></ul> <p><b>Example:</b> when we study 50-100 plants of soybean in order to know the effect of water pollution on their growth and yield, this study is called autecology.</p>	<ul style="list-style-type: none"><li>• <b>Synecology:</b> The study of relationship of different communities (grouping of population) to their environment is called synecology or community ecology.</li></ul>

17. Differentiate between micro and macro nutrients? (LB-2010)

**Macronutrients:** The elements which are needed by the organisms in large amount like hydrogen, oxygen, nitrogen, phosphorus, sulphur and calcium.

**Micro-Nutrients:** The elements which are required by organisms in small quantity or in traces like zinc, iron, molybdenum and iodine.

18. Differentiate between consumers and decomposers. **(OR)** What are consumers? (LB-2014)

**Consumers:** are all the organisms, primarily animals which use readymade organic food. They are mainly heterotrophic organisms. These may be primary, secondary or tertiary consumers. **(LHR-2014, 14)**

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

19. Differentiate between hydrosere and xerosere. (LB-2015, 2017)

**Hydrosere:** Primary succession starting in a pond is termed as Hydrosere, and plants of that habitat will be hydrophytes.

**Xerosere:** Primary succession starting on a dry soil or habitat is called xerosere. The plants growing in xeric conditions are called as xerophytes.

20. Differentiate between primary and secondary succession. **(OR)** How primary succession differ from secondary succession? (LB-2012, 2017)

**Primary Succession:** Succession is a community relay in which a community replaces the earlier. During primary succession an ecosystem is forged from bare rock or a clear glacial pool, where there is no trace of previous life. It is very slow in working.

**Secondary Succession:** Succession is a community relay in which a community replaces the earlier. During secondary succession, a new ecosystem develops after an existing ecosystem is disturbed, as in case of forced fire or an abandoned farmland. It happens much more rapidly because the pervious community has left its marks in the form of improved soil and seeds.

21. Differentiate between nitrification and denitrification. (2021).

Nitrification	Denitrification
<ul style="list-style-type: none"><li>Several bacteria in soil are able to oxidize ammonia or ammonium ions, this oxidation is known as nitrification.</li></ul>	<ul style="list-style-type: none"><li>Denitrification is the reverse of nitrification in which bacteria break down nitrates releasing nitrogen back into atmosphere and using the oxygen for their own respiration.</li></ul>

22. What is nutrient cycle? (2021).

**Biogeochemical Cycle:**

The cycle in which nutrients move from non-living components to living components of ecosystem in a cyclic manner is called as biogeochemical cycle or nutrient cycle.



## Chapter 26

### Short questions:

1. What is the composition of air of terrestrial ecosystem? (LB-2012)

These include taiga, tundra, deciduous forest, grasslands, tropical rain forests, and deserts. Taigas are cold-climate forests found in the northern latitudes.

2. What is the effect of human impact on Tundra ecosystem? (LB-2013)

**Human impact on Tundra Ecosystem:** Tundra is the most fragile of all the biomes because of its short growing season. Human activities in Tundra leave scars that persist for centuries. Fortunately the impact of civilization is localized around oil drilling sites, pipelines, mines and military bases.

3. What is the effect of human impact on Desert ecosystem? (LB-2010)

**Ans:**

**Human impact on desert ecosystem:**

As human activities are reducing the extent of many biomes, they are causing the spread of many biomes, a process called as desertification.

4. Where the Desert ecosystem is found in Pakistan. (LB-2018, 2021)

Desert found in Punjab Pakistan is called **Thal** and it is located in **Mianwali** and **Bukhar**

Desert found in Sindh Pakistan is called **Thar**

The desert ecosystem of the southern Punjab is known as Cholistan. It is located in Fort Abbas, Bahwal Nagar, Yazma, Bahwal Pur, Khan Pur and Rahim Yar Khan,

5. What is the range of rainfall and temperature in Temperate Deciduous Forest (**OR**) Discuss animal life of temperate deciduous forest? (LB-2012, 2021)

The average rainfall is between 750-1500 mm. Some very **common animals** are Macaca mulatto (rhesus monkey), black bear, leopard cat, deer and wolves. Microorganisms are also found such as bacteria, fungi and earthworms.

**Major plants:** The plants exhibit stratification i.e. layering. There are four layers in the forest.

(a) **Tree layer:** In the tree layer the trees form a continuous canopy.

The trees are 8 to 30 m tall. Some dominant trees are *Taxus baccanta*, *Pinus wallichinana*, and *Berberis lyceum*.

(b) **Shrub Layer:** The herbs and shrub layers grows to a height of 5m

(c) **Field Layer:** The field layer is made up of grasses, ferns and other herbaceous plants,

(d) **Forest floor:** The forest floor forms the fourth layer. At the bottom of floor level many mosses, liverworts, and lichen covered with litter layer are present.

6. What are the four major requirements for life? (**OR**) Which two are limiting factors interrestrial ecosystem?

Four major requirements for life are temperature, absorption of energy, nutrients and abundant water with appropriate temperature. Two limiting factors are temperature and air.

7. What is meant by layering in a grassland ecosystem? (**OR**) Give the layering characteristics of grassland. (LB-2013)

**Ans:**

**Layering:** It is the characteristics of grass-land ecosystem. Tall grasses e.g. Panicum form first layer. Mid-high grasses e.g. stipa form second layer, and third layer is formed by short grasses, forbs, warfare species mosses and lichens.

8. What is profundal zone? Give its one character. **(OR)** What type of organisms are present in profundal zone of lake? (LB-2018)

**Ans:**

**Profundal zone:** Here light is insufficient, to support photosynthesis. Decomposers and detritus feeders such as snails certain insect larva, bacteria, fungi and fish inhabit this zone. Dead organic matter falling from limnetic zone and littoral zone serve as food for the organisms.

9. Define productivity of an ecosystem.

**Ans:**

**Productivity:** Can be defined as the rate of production of new biomass during a specific period. Productivity is generally expressed in terms of grams or Kilocalories per square meter. The productivity can be indicated by consumption of CO<sub>2</sub> and evolution of oxygen in the process of photosynthesis.

**Example:** The productivity of temperate grass-land is 700- 1500 g/m<sup>2</sup>/year.

10. Differentiate between climate and weather. **(OR)** What is climate?

**Ans:**

**Weather:** refers to short term fluctuations in temperature, humidity, cloud cover, wind and precipitation over a period of hours and days.

**Climate:** refers to over all pattern of weather that prevails from year to year even century-to-century in a particular region.

11. Differentiate between thal and thar.

**Ans.**

**Thal:** The desert ecosystem found in western Punjab is called as Thal. It comprises of Mainwali and Bukhar districts.

**Thar:** The desert ecosystem found in Sindh is called Thar.

12. Differentiate between Alpine and Boreal forests. (LB-2009, 2018)

**Ans:**

**Alpine:** Coniferous forests located at high altitudes are called alpine e.g. in Kaghan, Dir, Chilas in Pakistan

**Boreal:** coniferous forests located at high latitude are called Boreal. e.g. in Canada, Eurasia.

13. Differentiate between Zooplankton and Phytoplankton. (LB-2008, 2011)

**Ans:**

**Phytoplankton:** It means drifting plants. These are aquatic, photosynthetic bacteria, algae, cyanobacteria and some other protists.

**Zooplankton:** It means drifting animals. These are found among aquatic plants and are mostly microscopic such as protozoan, crustaceans.

14. Differentiate between Prairies and Savanna.

**Ans:**

**Prairies:** Grass lands present in temperate climate are called prairies. Prairies do not have woody plants e.g. prairies of North America, Pampas of Argentina.

**Savanna:** Grass lands present in tropical climate are called savanna. These have woody trees also.

15. Differentiate among littoral, limnetic and profundal zone. **(OR)** Characterize littoral zone of fresh water lakes. **(OR)** What is limnetic zone mention its life. (LB-2013, 2014, 2021)

**Ans:**

Limnetic Zone	Profundal Zone
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<ul style="list-style-type: none"> <li>• In limnetic zone enough light penetrates to support photosynthesis.</li> <li>• In limnetic zone, phytoplankton includes cyanobacteria (blue green algae) which serve as producers.</li> <li>• In limnetic zone; phytoplankton are eaten by protozoa and small crustaceans, which in turn are consumed by fish.</li> </ul>	<ul style="list-style-type: none"> <li>• In profundal zone, light is insufficient.</li> <li>• The organisms of profundal zone are mainly nourished by detritus that falls from the littoral and limnetic and by incoming sediment.</li> <li>• Decomposers and detritus feeders such as snails and certain insects larvae, bacteria, fungi and fishes inhabit in profundal zone.</li> </ul>
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**Littoral zone:** It is a zone near the shore of the lake. In this zone, there is shallow water, abundant light, anchorage, and abundant nutrients. It has diverse community including lilies, submerged plants, plankton, crustaceans, snails, flatworms, hydra, snakes, frog and turtles.

16. Describe animal life of Grassland ecosystem. (LB-2012)

**Ans:**

**Animal life of grass land ecosystem:** Dominant species are herbivores. Invertebrates include, insects (Grasshoppers) are common. Other herbivores are zebras, wild horses and bisons. The predators are lizards, toads and turtles.

17. Enlist two adaptations in plants and two in animals for a terrestrial ecosystem. (OR) Give two adaptations of terrestrial ecosystem. (LB-2010, 2012, 2019)

**Ans:**

**Adaptations on land:**

- Plants have evolved vascular bundles for support.
- Animals have evolved skeleton for support.
- Plants have evolved methods to conserve water and regulate temperature.
- Animals have evolved skin to conserve water.

18. Give the name of some major ecosystems on land in Pakistan.

**Ans:**

**Major Ecosystems in Pakistan:**

Temperate deciduous forests	e.g. Shogran, Neelam Valley
Coniferous forests	e.g. Kaghan, Dir
Grass land ecosystem	e.g. Gilgit, Kashmir
Desert ecosystem	e.g. Mainwali, Bukhar, Sindh
Tundra ecosystem	e.g. Kara-Koram, Hindu Kush.

19. Give location of Tundra ecosystem in Pakistan. (LB-2014)

**Ans:**

**Tundra:** is used to describe type of vegetation in treeless high latitude between taiga and polar ice caps, and high altitudes across the mountains above the timberline such as in the mountains of Karakoram and Hindukush of Pakistan.

20. Mention the characteristics of plant life in desert ecosystem. (LB-2013)

**Ans.**

**Plants in Desert Ecosystem:** The plants are often spaced widely spaced. The plants are covered with waterproof waxy coating and have succulent stems. Examples, Cacti and Euphorbia.

## Chapter 27

### Short questions:

1. What is acid rain? (LB-2013)

**Ans:**

**Acid Rain:** Sulphur dioxide and Nitrogen dioxide produced during the burning of fossil fuels; combine with water vapors in the atmosphere to form acids,

Nitrogen dioxide + water vapors \_\_\_\_\_ Nitric acid + Nitrous acid.

Sulphur dioxide + water vapors \_\_\_\_\_ sulphuric acid + sulphurous acid.

These acids fall either dissolved in rain or as microscopic dry particles. This entire phenomenon is termed as acid rain.

2. What is Eutrophication? (OR) What is algal bloom? (LB-2015)

The gradual accumulation of nutrients such as phosphates from fertilizers, animal wastes from livestock and discharge from sewage treatment in aquatic ecosystem (lakes, seas) results in Eutrophication. In eutrophic (nutrient rich) lakes the rapid and extensive growth of algae and other organic matter on the surface water called as algal bloom.

3. What is Ozone? (OR) Give the importance of ozone layer. (LB-2017)

**Ozone layer:** A layer of ozone gas in upper atmosphere extending from 10-50 km above earth. In pure form Ozone is bluish explosive and highly poisonous gas. Chemically it is O<sub>3</sub>.

4. What is pollutant?

A pollutant is a substance or energy introduced into the environment that has undesired effects, or adversely affects the usefulness of a resource.

5. Write names of various types of pollution. (LB-2011)

**Pollution:** The befouling of the environment by anything produced by human, which is or may be harmful to human life and other living organisms is called environmental pollution. Main types of pollution are

Air Pollution

Water Pollution

Soil Pollution

Radiation Pollution

Noise Pollution

6. What are the main sources of water pollution? (OR) Give main causes of water pollution. (LB-2012, 2015)

**Water pollution:** The befouling of the water bodies (like streams, rivers, lakes, bays, seas, oceans and underground water) by anything that is harmful to living organisms is called as water pollution.

**Sources of water pollution:**

The main sources are

- Sewage incomplete treatment
- Leakage of oil in sea
- Detergents from houses and laundries

7. Write the causes and effects of ozone depletion? **(OR)** Give the effects of ozone depletion on life. (LB-2012, 2019)

**Cause of Ozone depletion:** Major causes of ozone depletion are CFCs (Chlorofluorocarbons) produced from air conditioners and refrigerators. As CFCs rise in atmosphere, ultraviolet rays cause Chlorine to release which destroy O<sub>3</sub> molecules. A single chlorine atom can react with ultraviolet rays and destroy as many as one million ozone molecules.

**Effects of Ozone depletion:** Ozone depletion allows the ultraviolet rays to reach the earth. Ultraviolet rays will affect all life forms on earth by increasing temperature. They cause skin cancers and cataract in humans. They can also affect crops, plants, trees and even marine plankton and disturb weather pattern.

8. What are solid wastes and how these can be used as source of energy? **(OR)** Give importance of solid waste.

**Solid waste recycling:** Solid wastes like trash, paper, organic manures, and plastic materials, agricultural and industrial wastes can be converted into oil and gas by hydrogenation. Wastes as source of pollution can also be minimized.

9. What do you mean by non-renewable resources? **(OR)** What are renewable resources. Give examples. **(OR)** Differentiate between renewable and non-renewable resources. (LB- 2011, 2013, 2014, 2016, 2018)

**Renewable Resources:** These are such types of resources which are used again and again. There are a natural cycles to make them reusable.

**Examples:** air, water, food, land.

**Non-renewable Resources:** These are such type of resources which once consumed cannot be replaced. These are exhaustible resources and are not recycled.

**Examples:** metals, some non-metallic minerals and fossil fuels as coal, oil, gas.

10. What measures should be taken for conservation of energy? **(OR)** How we can save energy? Mention any four ways in which we can save energy. **(OR)** Write four ways of energy conservation? (LB-2014, 2017)

**Energy conservation:**

- Use energy efficient machines.
- Reduce wastage by recycling.
- Drive less, walk and use public transport more.
- Switch off light and other appliances when they are not in use.
- Minimize the use of air conditioners.
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11. What is deforestation? **(OR)** What is afforestation? **(OR)** What is reforestation? **(OR)** What is the difference between deforestation and afforestation? **(OR)** Differentiate between afforestation and reforestation. **(OR)** What is the difference among deforestation, afforestation and reforestation? (LB-2014, 2015, 2019)

**Deforestation:** Clearance of vast areas of forests for procuring lumber, planting crops or grazing cattle is called deforestation.

**Afforestation:** Establishment of new forests where no forest existed previously is called Afforestation.

**Reforestation:** Replantation of trees in an area where trees have been removed by deforestation is called reforestation.

12. Define greenhouse effect.

**Green House Effect:** The carbon dioxide of the atmosphere behaves like glass sheet of green house and absorbs the sun energy and do not allow it to escape outside. So the temperature of the atmosphere increases. This is called Green House effect. Its main **causes** are over-urbanization, deforestation and industrialization.

13. Describe abuses of land. (LB-2012)

Soil is continuously being depleted of its minerals nutrients due to vigorous crop production, poor agricultural practice, extensive grazing, leeching, rapid urbanization. Fertilizers, insecticides and pesticides are also polluting the soil.

14. Define soil and give its basic constituents. **(OR)** What is soil? **(OR)** What is soil? Give its basic constituents. (LB-2016, 2018)

**Soil:** can be defined as the upper layer of earth's crust. The basic components of soil are soil particles, soil water, soil air, and organic matter and soil organisms.

**Role of soil:**

- It provides water, organic and inorganic nutrients to plants.
- Provides support to terrestrial organisms as anchorage to plants. 11% area of land is under cultivation, so it meets the needs of growing human population

15. Differentiate between health and disease.

**Normal Health:** The steady internal state of homeostasis is known as Normal health.

**Disease:** It may refer to the departure from normal or steady internal state of homeostasis, through structural or functional disorders of the body.

16. Discuss importance of forests.

**Importance of forests:** Forests

- Provide protection to man and other species.
- Are source of fruits for animals.
- Regulate water flow, prevent soil erosion.
- Provide timber, firewood and medicines.
- Make the environment pleasant.
- Act as environment buffers.

17. Differentiate between Population Explosion and Population Pressure. **(OR)** Enlist some reasons of Population Explosion in the world also describe Population Pressure. **(OR)** Write the reasons of world Population Explosion. **(OR)** What do you mean by Population Explosion and give its two causes? (LB-2010,2013,2014)

**Reasons for population explosion:**

- Disease control, public, personal and food hygiene.
- Improved nutrition.
- Improved housing and living standard.
- Child care, maternity, parent-craft and welfare services.

**Population pressure:**

Effect of increasing population on the environment is called population pressure.

As the human population increases there is increased demand for food. To meet the needs, humans convert the natural ecosystems to farmlands. More people more, more agriculture and more industrialization is stressing the environment.

18. How is air important to life as a source? (LB-2012)

**Air:** Air is a thick blanket of atmosphere surrounding the earth. It consists of

- Nitrogen (79%),
- Oxygen (20%)
- CO<sub>2</sub> (0.03%) and
- Some inert gases.

Oxygen is consumed during respiration. CO<sub>2</sub> is used during photosynthesis. Nitrogen is used as raw material for many organic compounds

19. Name two pathogenic and two congenital diseases. (LB-2018)

Pathogenic diseases are Tuberculosis, Small pox, malaria. Congenital diseases are Haemophilia, Down's syndrome, and Turner's syndrome.

20. Why trees are called environmental buffers? (OR) Define environmental buffers.

**Forests as environmental buffers:**

Forests intercept heavy rainfall and release the water steadily and slowly to the soil beneath and to streams and rivers. The tree roots hold the soil in place so prevent soil erosion and silting up of lakes, rivers and dams. These also prevent heavy floods. Due to these reasons forests are called environmental buffers.

21. What is fossil fuel? (LB-2019)

**Fossil fuels:**

- Fossil fuels are the remains of plants and animals of past which became buried due to environmental hazards and were fossilized in deeper layers of earth and sea.
- Coal, oil and gas are fossil fuels which are completing our 95% of daily energy demand.
- As fossil fuels are very limited so they will exhaust soon. This will affect our standard and life style. This source is therefore very carefully used.

22. How man is responsible to increase the number of endangered species? (LB-2019)

- Human increases number of Endangered Species.
- Man is leaving negative effects on wild life.
- Due to uncontrolled hunting many species have become extinct or near to be extinct called endangered species.
- There are thousands of endangered species now present in this world.
- Wild life is also non-renewable resource so it needs conservation.
- Rare species are kept in zoo, where they can be safely breed
- Fishing in water reserves is prohibited which also one of the steps is taken to protect marine life.

23. How Depletion and Degradation of resource occur on planet earth? (LB-2019)

The earth's natural resources include the physical resources of water, air, soil, chemical elements and fossil fuels, together with all other species of living organisms.

- **Deforestation** and cutting down of natural woodlands for land clearance and building material, fuel requirement destroys natural habitat of organisms.
- **Forest:**  
Forests are very important component of human environment. They provide the man timber, fire wood, medicine and many other products. Deforestation is leading towards the clearance of land and creating many problems for man and other species.
- **Water:**  
Water is our natural resource and we cannot live without water. By extensive use of water, the natural recycling process is affected. Water reserves are so rapidly used that they cannot be replaced by rainfall. Water purification and sewage treatment are slow processes. Only 30% of the earth is dry land and the remains covered with water.