Kerala **Class 10**

English Medium

Volume : 1

Units :

1. Sensations and Responses
2. Windows of Knowledge
3. Chemical Messages for Homeostasis
4. Keeping Diseases Away

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1. SENSATIONS AND RESPONSES

CONTENT

- External and internal stimuli
- Neuron -structure, Impulse generation and transmission.
- Types of nerve.
- Central nervous system
  - Brain & Spinal cord – structure and functions.
  - Reflex actions
- Peripheral nervous system
  - Sympathetic and parasympathetic nerves
- Disorders of nervous system
  - Alzheime'rs, Parkinsons & Epilepsy.

QUESTIONS & ANSWERS

1. Define stimulus.

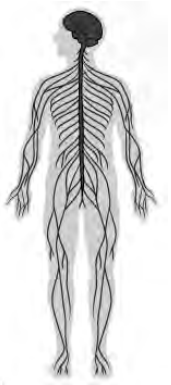
The senses that evoke responses in organisms are called stimuli. These are two types,

External stimuli :- Sound, touch, heat, chemicals, pressure, cold, radiations.

Internal stimuli :- Hunger, touch, infection, pressure variation, thirst, exhaust.

2. What is the function of nervous system ?

To generate and coordinate responses according to external and internal changes.



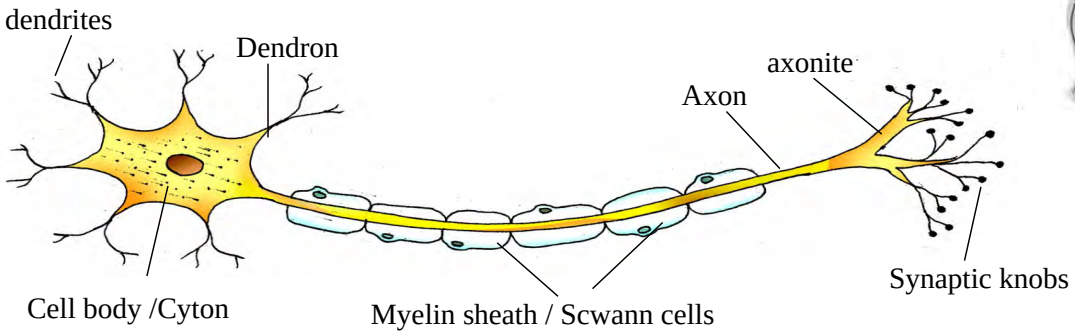
3. Name the parts included in our nervous system.

Brain, spinal cord, nerves and receptors.

4. The structural and functional units of the nervous system ?

Neurons (nerve cells).

5. Structure of a model neuron.



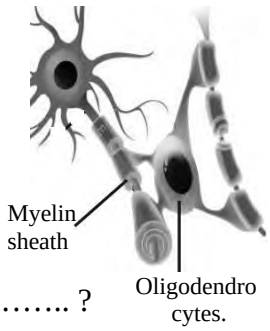
A neuron has mainly the following parts; a cyton (cell body), impulse receiving dendrons (branches are known as dendrites), impulse transmitting axon (branches are axonites) and synaptic knobs for secreting neurotransmitter.

In certain neurons, the nerve fibres are covered by myelin sheath, made up of white shining Schwann cells.

6. The protective covering of nerve fibres (axons) ? Mention its function.

Myelin sheath.

- Provide nutrients and oxygen to the axon.
- Accelerate impulses.
- Act as an electric insulator.
- Protects the axon from external shocks.
- Gives white appearance ('white matter') to the neural parts.



7. In brain and spinal cord, myelin sheath is formed from a specialized cells called …….. ?

Oligodendrocytes.

8. Differentiate between white matter and grey matter.

The part of nerve, where myelinated neurons are present in abundance,is called as the white matter.

The part of nerve where the cell bodies and nonmyelinated neurons are present, is called as the grey matter.

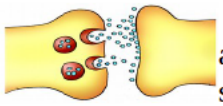
9. Table showing the function of different parts of nerve cell.

Part of nerve cell	Function
Dendrite	Receives impulses
Dendron	Carries impulses from dendrite to the cell body
Cyton / Cellbody	Passes impulses to the axon.
Axon	Carries impulses from the cell body to outside.
Schwann cells	Protects the axon and increases the speed of impulse
Axonite	Carries impulses to the synaptic knob
Synaptic knob	Secretes neurotransmitter

10. Name the swollen ends of axon . How is it important in the transmission of impulse ?
Synaptic knobs, from which neurotransmitter secretes. The impulses are transmitted across the synaptic cleft only through a chemical (neurotransmitter), secreted from the synaptic knobs.

11. Give example for neurotransmitter.
Acetyl choline (Dopamine is another example)

12. Define synapse.
The junction between neurons or between neurons and muscles or glands is known as the synapse.



It helps to regulate the speed and direction of impulses. The impulses are transmitted across the synaptic cleft only through a chemical (neurotransmitter), secreted from the synaptic knobs.

13. The electrical messages conducted through nerves ?
Impulses

14.How is an impulse generated ?
The difference in the distribution of ions maintains positive charge on the outer surface and negative charge inside the plasma membrane of the receptor part of neuron. When stimulated, this ionic equilibrium (polarity) changes there and the outer surface becomes negatively charged and inner become positively charged. As a result, impulse generated. This charge difference stimulates its adjacent parts and similar changes occur there too. Thus a continuous flow of the impulse becomes possible.

15. How is the impulses transmits through the neurons ?
Impulse due to stimulus → dendrites → dendrons → cyton → axon → axonites → synaptic knob → secretion of neurotransmitter to the synaptic cleft → Stimulation in the adjacent dendrites → Impulse forms.

When impulses reach at the synaptic knobs, a chemical substance, known as neurotransmitter, released in the synaptic cleft. This chemical stimulates the adjacent dendrites to form new electric impulses.

16. Name the two types of neurons ?
Sensory neurons – (carry impulses from different body parts to the brain and spinal cord)
Motor neurons - (carry impulses from the brain and spinal cord to various parts of body)

17. Define a nerve ?
A nerve is a group of axons or nerve fibres, covered by connective tissue.

18. Show different kinds of nerves with their functions in a table.

Sensory nerves (consists of sensory neurons)	Carry impulses from sense organs to the brain and spinal cord
Motor nerves (consists of motor neurons)	Carry impulses from brain and spinal cord to different organs
Mixed nerves (consists of sensory and motor neurons)	Carry impulses from brain and spinal cord to different organs and vise versa

tty

19. How is human nervous system classified ?

Central Nervous System	Peripheral Nervous System
- Brain	- Cranial nerves (12 pairs)
- Spinal cord	- Spinal nerves (31 pairs)

20. The protective measures for human brain ?
The brain is protected inside a hard skull and is covered by a three layered membrane, called the meninges. Cerebrospinal fluid,a fluid formed inside the meninges, also protects the brain.

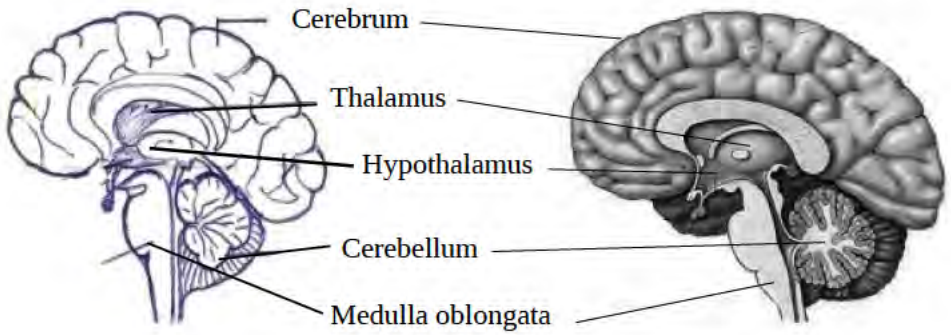
21. The outer covering of brain and spinal cord ?
Meninges.

22. The fluid which provides nutrients and oxygen to brain tissues ?
Cerebrospinal fluid (CSF).

23. How is the CSF form? Give its function ?
Cerebrospinal fluid is a fluid formed from the blood inside the meninges and eventually reabsorbed to the blood. Functions of CSF are,

- CSF provides nutrients and oxygen to brain tissues.
- Regulates the pressure inside the brain.
- Protects brain from injuries.

24. Name the functional parts of human brain.
Human brain has outer cerebrum, cerebellum and medulla oblongata and inner thalamus and hypothalamus.



25. Table showing different parts of brain, peculiar feature and functions of each.

Part of the brain	Features	Function
Cerebrum	The largest part of the brain with many fissures and folds in its cortex. Cerebral cortex is seen as grey matter and inner medulla as white matter.	Centre of feeling senses and also the centre of qualities like thought, imagination, intelligence and memory.
Cerebellum	The second largest part, seen as two flaps.	Coordinates muscular activities and maintains equilibrium of the body.
Medulla oblongata	The rod shaped lower part	Controls involuntary actions like heart beat and breathing.
Thalamus	The seat of cerebrum	Acts as relay station of impulses to and fro the cerebrum and also analyses the impulses.
Hypothalamus	Seen just below the thalamus	Plays a major role in the maintenance of homeostasis.

26. The largest part of human brain ?
Cerebrum.

27. The peripheral part of brain is the ---------- .
Cerebral cortex.

28. There are many fissures and folds in the cerebral cortex. What is the advantage of this ?
This is an adaptation to include more number of neurons and there by increase the efficiency of cerebrum.

29. Any mild injury to the medulla oblongata may lead to sudden death. Why ?
Medulla oblongata controls involuntary actions like heart beat and breathing. Any mild injury to medulla oblongata results malfunctioning of breathing and heartbeat and this may lead to death.

30. A person could not walk easily after drinking alcoholic beverage. Can you say which part of his brain is affected ?
Cerebellum, which maintains equilibrium of the body through muscular coordination.

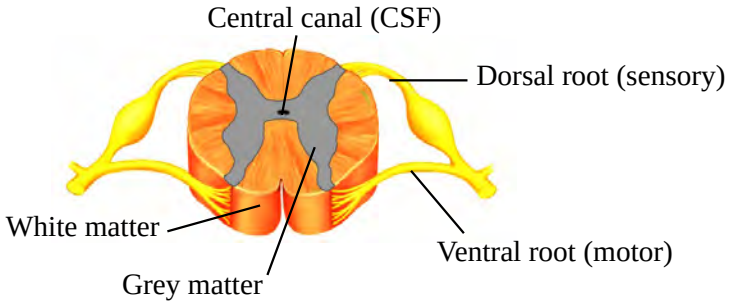
31. After a road accident, a person lost his memory for a few days. In which part of his brain got injured ?
Cerebrum.

32. The central nerve, seen as the continuation of medulla oblongata ?
Spinal cord.

33. How is our spinal cord protected ?
Spinal cord is protected inside the vertebral column and is covered by the meninges.

34. The ---------- of the spinal cord is filled with cerebrospinal fluid.
Central canal.

35. Describe the structure of our spinal cord.
Spinal cord, which is the continuation of medulla oblongata, is situated with in the vertebral column and is covered by a three layered membrane, called meninges. The outer part of spinal cord is white matter and inner is grey matter. The central canal at its centre is filled with CSF.
Spinal nerves originate from the spinal cord as dorsal root (sensory) and ventral root (motor).

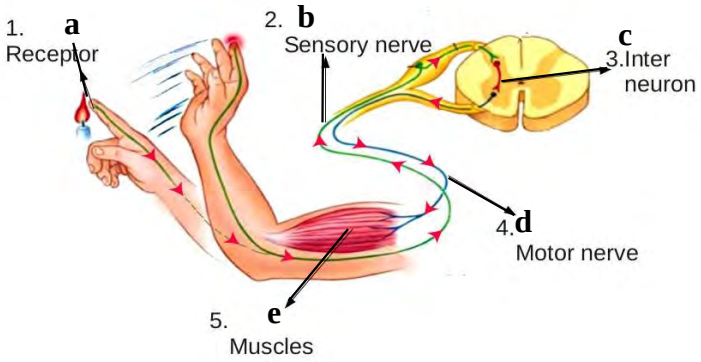


36. Spinal cord : Sensory impulse : Dorsal root;
Spinal cord : Motor impulse : ….....
Ventral root.

37. Mention the functions of spinal cord.
- Transmitting impulses from different parts of our body to and fro the brain.
- Coordinates the rapid and repeated movements during walking, running etc.
- Effects certain reflex actions.

38. What do you mean by reflex action ?
Reflex actions are the accidental and involuntary responses of the body, in response to a stimulus.
These are two types,
1. Cerebral reflexes (Eg:-Blinking of eyes, sudden fright when hearing a loud noise or seeing a snake, sneezing)
2. Spinal reflexes (Eg :- On touching hot object, the hand is withdrawn, withdrawal of the leg when a spine pierce in to the feet)

39.The pathway of impulses in a reflex action.
Reflex arc.



40. What are the parts that involve in a reflex arc ?
a. stimulus receiving receptor
b. sensory neuron
c. inter neuron
d. motor neuron
e. effecting muscles.

41. The central neuron, which converts sensory impulse in to motor impulse, is usually known as an --------- .

Inter neuron.

42. Observe the flow-chart and name the process.
Stimulus – Receptor – Sensory neuron – Inter neuron – Motor neuron – Muscle.
(Reflex action / Reflex arc)

43. A few nerves in the peripheral nervous system that function automatically and involuntarily, is known as ---------- ?
Autonomous nervous system.
It includes sympathetic and parasympathetic nerves.

44. How the contrasting actions of Sympathetic and Parasympathetic nervous systems help to maintain the normalcy of the physiological activities ?
Sympathetic and parasympathetics nervous system activate with or with out the endocrine gland system involuntarily. The contrasting actions of both systems help to maintain the normalcy of the physiological activities.

	Action of Sympathetic nervous systems	**Action of Parasympathetic nervous systems**
Eye	Pupil dilates	Pupil constricts
Heart	Heartbeat increases	Heartbeat becomes normal
Lungs	Trachea expands	Trachea contracts
Liver	Glycogen converts to glucose	Glucose converts to glycogen
Adrenal gland	Hormone secretion increases	Hormone secretion decreases
Urinary bladder	Retain normal state	Constricts
Salivary gland	Production of saliva decreases	Production of saliva increases
Stomach	Working decreases	Increases
Intestine	Peristalsis slows down	Peristalsis increases

45. List out the physiological changes that may occur when a boy facing the audience during a competition.
(*see the activities of the sympathetic nerves*)

46. The table showing neural disorders, reason and symptoms.

Disorder	**Cause**	**Symptom**
Alzheimer's	Continuous degeneration of neurons due to the accumulation of an insoluble protein.	Complete loss of memory.
Parkinsons	Degeneration of specific ganglia in the brain due to the deficiency of dopamine	Loss of body balance. Tremor in muscles, flow of saliva
Epilepsy	Discharge of irregular electrical impulses from brain.	Fits (due to uncontrolled muscular contractions), frothy discharge from mouth, clenching of teeth, unconsciousness

47. Name a neurotransmitter, which is secreted in the brain. What will happen when the production of this hormone cease in a person ?
Dopamine.
The deficiency of dopamine may result a disease called Parkinsons.

Video link of this chapter
Part 1- https://www.youtube.com/watch?v=fTAHU3eQBRQ&t=0s
Part 2- https://www.youtube.com/watch?v=rUsbf7pulMo&t=9s
Part 3- https://www.youtube.com/watch?v=IQFZ6CBXBmE&t=17s
Focus area covered portion - https://youtu.be/Crzs2t3r7Hs

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2. WINDOWS OF KNOWLEDGE

CONTENT

- Vision - The protective measures of eyes.
  - Structure of human eye, Working of eye lens,
  - Photo receptors in the retina, Sense of vision.
  - Disorders & diseases of eyes, Hygiene of our eyes.
- Hearing- Structure of human ear, Auditory receptors,
  - Sense of hearing, Body balancing.
- Tasting - Taste receptors in the tongue, sense of tasting.
- Smelling - Olfactory receptors in the nose, sense of smelling.
- Different receptors in the skin
- Sensory receptors in certain other organisms

Video link of this chapter :

Part 1- https://youtu.be/Q14Texfdi9c

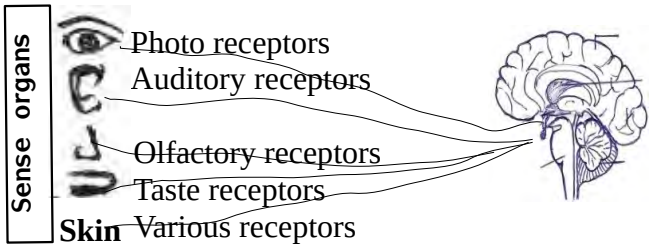
Part 2- https://youtu.be/X5RvWrwrg8U

Part 3- https://youtu.be/377Wct4nVgA

QUESTIONS & ANSWERS

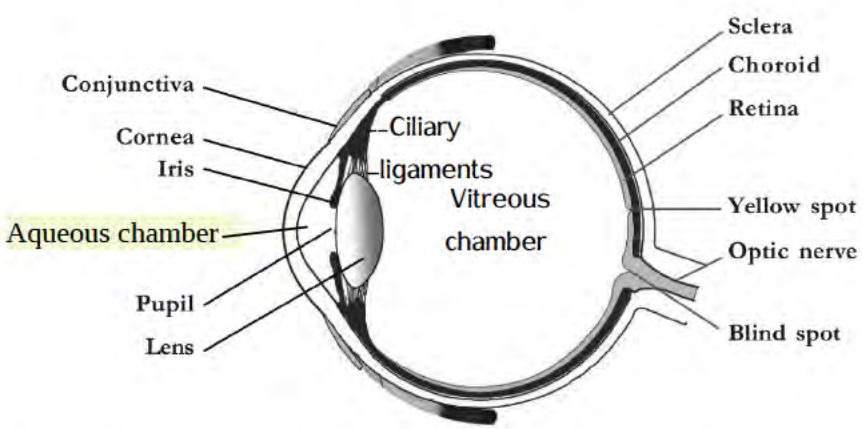
1. How is the feeling of senses made possible ?

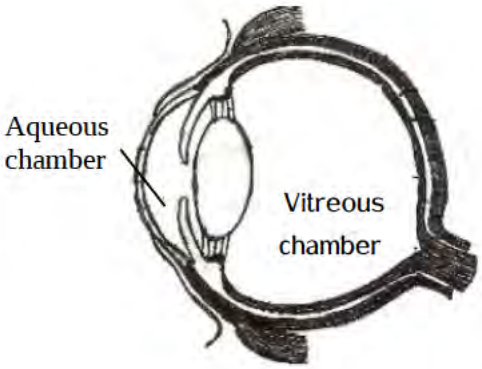
Sense is possible only when impulses from sense organs reach at the brain through the sensory nerves. The ends of sensory nerve from the brain act as the receptors inside the sense organs.



	Receptors	Stimulus	Function
Eye	Photo receptors in the retina (Rod & Cone cells)	Light	Vision
Ear	Auditory receptors in the basilar membrane	Sound	Hearing
Nose	Olfactory receptors	Olfactory particles	Smelling
Tongue	Taste receptors in the taste buds	Taste particles	Tasting
Skin	Receptors for heat, cold, touch, pressure and pain	Heat, cold, touch, pressure or pain	Heat, cold, touch, pressure and pain

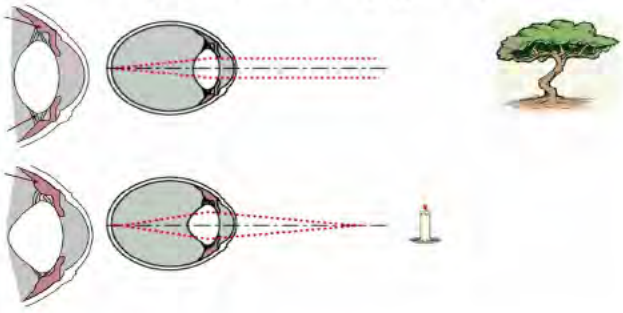
2. How are our eyes protected?
   - Bony eye socket (orbit) - protects eye.
   - External eye muscles – fixes the eye ball in the orbit.
   - Eyelids - protect from dust and other particles.
   - Eyelashes - protect from dust with out obstructing vision.
   - Eyebrow – prevents perspiration or water reaching in to the eyes.
   - Tears - clean and lubricate the anterior part, washes away the dust particles and destroys germs.
   - Conjunctiva – secretes mucus to prevent the eye from being dry.
3. The enzyme contained in tears ? Ans: Lysozyme.
4. Which are the 3 layers of human eye ?
   a. **Sclera** –The outermost, strong layer, that gives shape. Its transparent anterior portion is the **cornea**.
   b.**Choroid**- Middle layer of blood capillaries, which supply nutrients and oxygen.
   Its anterior dark screen with pupil is the **iris**. A convex lens is placed behind the iris.
   c. **Retina**- The innermost layer on which, the image forms. The optic nerve starts from the retina.
5. The fluids filled in the chambers of eye , position and function ?
   * **Aqueous humor** – A watery fluid seen in the aqueous chamber [between cornea and lens] , oozes from the blood. This fluid supplies nutrients and oxygen to cornea and lens.
   * **Vitreous humor** - A jelly like fluid filled with in the vitreous chamber [between lens and retina], helps to maintain the shape of eyeball.





6. Slightly projected transparent anterior part of the sclera ? Ans: Cornea.
7. The transparent membrane which protects the sclera, except the cornea ? Ans: Conjunctiva.
8. The dark coloured anterior part of choroid is --------, which contains the pigment melanin. Ans: Iris.
9. The aperture at the centre of iris ? Ans : Pupil.
10. The antagonistic muscles in the iris that regulate the size of eye pupil ?
    Radial muscles (pupillary dilator) and Circular muscles (pupillary constrictor).
11. When bright light falls, the eye pupil --------- ?
    - Constricts [due to the contraction of the circular muscles]
12. The muscles, which adjust the curvature of eye lense, seen behind the iris ?
    Ciliary muscles.
13. Define the power of accommodation of the eye.
    The capacity of the eye to change the curvature of lens depending up on the distance between the the eye and the object by adjusting the focal length is called the power of accommodation of the eye.
14. How can our lens adjust its focal length according to the distance from objects?
    [How is power of accommodation possible?]
    When we look at a distant object, the ciliary muscles are in a relaxed position so as to keep the ligaments tight. Therefore the curvature of lens decreases to fix the image on retina [figure-1].
    When we look at a near object, the ciliary muscles contract to loosen the ligaments. When ligaments relax, the curvature of lens increases naturally ,to focus the image on retina. [figure-2].

	Viewing distant objects	Viewing near objects
Ciliary muscles	Relaxes	Contracts
Ligaments	tightens	loosen
Curvature of lens	Decreases	Increases
Focal length	Increases	Decreases

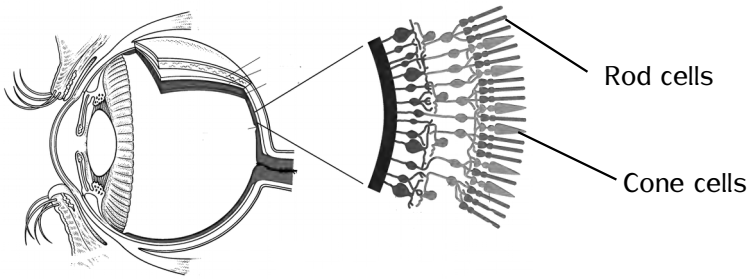


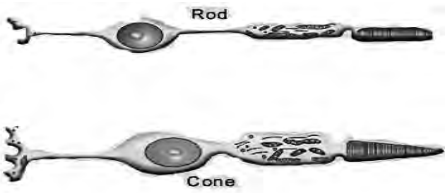
15. The characteristics of images formed on retina ?.
    Real, Small, Inverted and Accommodated.
16. Compare and contrast between the photo receptors seen on the retina.

Photoreceptor	Containing pigment	Function	Related disorder
Rod cells	Rhodopsin	Vision under dim light	Night blindness
Cone cells	Photopsin / Iodopsin	Vision under intense light	Colour blindness

Receptor region of the rod cells is rod shaped and contain the pigment rhodopsin, which will be stimulated under dim light. Receptor region of the cone cells is cone shaped and contain the pigment photopsin (iodopsin) which will be stimulated under intense light.

Under dim light, rhodopsin dissociates to form retinal and opsin to produce impulses from rod cells. Under intense light, photopsin (iodopsin) dissociates to form retinal and opsin to produce impulses from cone cells. The three types of cone cells (red, green & blue) provide us with colour vision.





17. Vitamin A help us for better vision. Give reason.
Retinal, the visual pigment found in the photoreceptors, is formed from vitamin A.

18. Compare between Blind spot and Yellow spot
Blind spot is a part of retina from where the optic nerve begins. No photoreceptors at this spot, hence no vision. Yellow spot is the point of highest vision in the retina, where more cone cells seen. Images form in and around the yellow spot.

19. Point on retina lacking vision : Blind spot ; Point of highest vision in retina : --------- ?
Yellow spot

20. The bird, owl has no vision in day time. Why?
Owl's retina is devoid of cone cells and hence no vision in day time.

21. Animals like cat and owl have more vision at night. Why ?
Cat and owl has more rod cells in their retina, so that they have more vision at night.

22. A kite can locate its prey even from high altitude. How is this possible ?
The eyes of kite are closer to each other and contain a large number of cone cells. Hence it has high power of vision.

23. Flowchart of image formation in retina.
Light rays from the object → Cornea → Aqueous humor / Pupil → Lens → Vitreous humor → Image on retina

24. What are the changes occur in retina when images focus on it ? (Describe that how vision is possible.)
When light rays from the object passes through cornea and pupil fall on the lens, a small, real inverted image forms on the retina. When the image is formed under dim light, rhodopsin in the rod cells dissociate to produce impulses and when the image is formed under intense light, photopsin in the cone cells dissociate to produce impulses. These impulses are transmitted through the optic nerve. The brain coordinates the images from both eyes to feel perfect vision.

25.Experience of vision - Flowchart.
Image on retina → stimulation in the photo receptors → dissociation of rhodopsin / photopsin → impulses → optic nerve → coordination of images by cerebrum → perfect vision.

26. Though images of object are formed in both eyes, we can see only one object. Give reason.
Cerebrum coordinates the two images and hence get a three dimensional view of the object.

27. Define binocular vision.
The ability of both the eyes to focus on the same object is known as binocular vision.
Binocular vision help us to get a three dimensional image of the object. This help us to calculate the correct distance, depth, height and width of the object.

28. What is the need of closing one eye while shooting an object ?
Binocular vision help us to get a three dimensional image of the object and to calculate the correct distance, depth, height and width of the object. But in the case of aiming an object, we need to get correct line instead of common focus through binocular vision.

29. The condition by which certain colours cannot recognize : Colour blindness ;
Decreased vision in dim light : ---------- ? Ans: Night blindness.

30 .---------- and ---------- are the two conditions of eye due to the deficiency of vitamin A.
Night blindness and Xerophthalmia (dry conjunctiva and cornea)

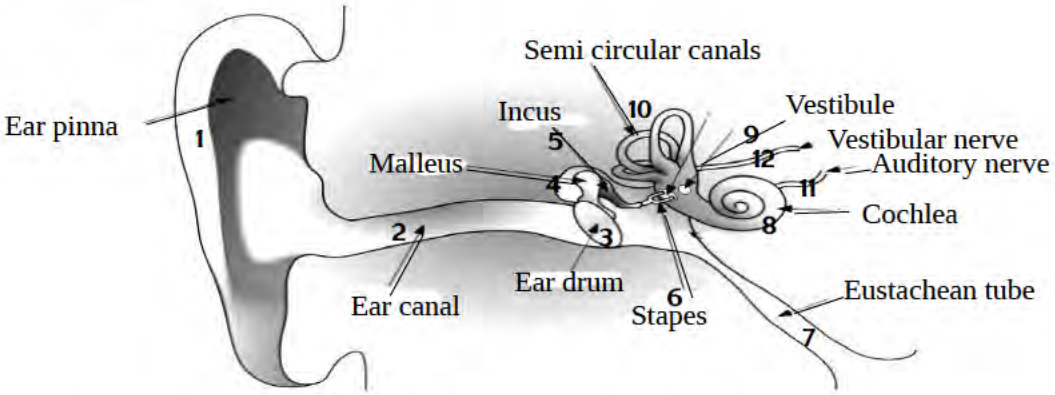
31. A few points related with the health of our eyes.
- Avoid falling of bright source of light directly to the eyes. Don't look at the sun.
- Avoid reading under dim light.
- Do not watch TV or other screens continuously.
- Frequently wash our eyes.
- Include vitamin A contained items in our daily food.

32.Table which shows reason of various disorders and diseases that affect on our eyes.

Disorder/Disease	Reason or Symptom	Remedy
Hyper metropia (long sight)	Due to shortened eyeball images form behind retina. Cannot see nearby objects clearly	Convex lens
Myopia (short sight)	Due to elongated eyeball images form in front of retina. Cannot see distant objects clearly	Concave lens
Night blindness	Due to the deficiency of vitamin A, no clear vision in dim light.	Vitamin A
Colour blindness	Due to the defect cone cells which detect red and green colours and fails to detect those colours	
Xerophthalmia	Prolonged deficiency of vitamin A results dry conjunctiva and cornea	Vitamin A
Cataract	Gradual decrease in the power of lens due to decreasing of transparency of lens	Surgical replacement of lens
Glaucoma	Defective vision due to increased pressure when the re-absorption of aqueous humor obstructed	Early treatment
Conjunctivitis	Infection of bacteria or virus causes red eye with pain	Treatment and rest

33.The functions of human ear ? Ans: Hearing, body balance.

34. What are the main parts of human ear ?



External Ear
1. Ear pinna
2. Ear canal
3. Ear drum / Tympanum

Middle Ear
4. Malleus
5. Incus
6. Stapes
7. Eustachian tube

Internal Ear
8. Cochlea
9. Vestibule [Sacule, Utricle]
10. Semicircular canal
11. Auditory nerve
12. Vestibular nerve

35. The safety measures to prevent dust and other particles from entering the ear are, ----------
Hairs and ear wax.

36. When sound waves enter to the ear, ... starts to vibrate. Ans: Ear drum (tympanum)

37. The smallest bone in the human body ? Ans: Stapes

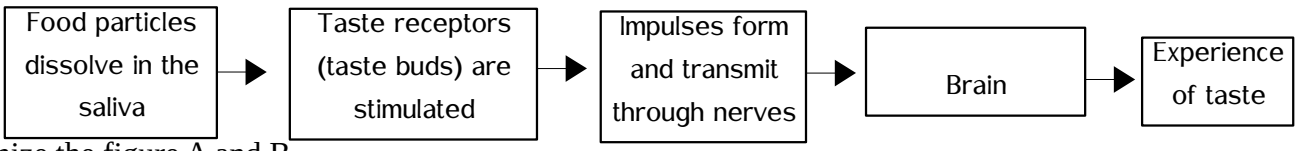
38. Name the bones of ear ossicles. Ans: Malleus, Incus, Stapes.
They amplify sound waves 22 times and pass the vibrations from the ear drum to the oval window.

39. The tube that connects the middle ear to the pharynx ? What is its function ?
Eustachian tube. It helps to regulate the pressure inside the middle ear.

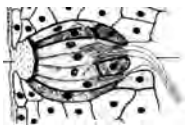
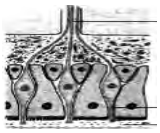
40. The structure of internal ear.
The internal ear, seen inside the bony labyrinth, as membraneous labyrinth. A coiled tube like cochlea and the vestibular apparatus (vestibule & three semicircular canals) are the parts of inner ear. The membraneous labyrinth is filled with a fluid, named endolymph and the space between the bony and membraneous labyrinths is filled with another fluid, named perilymph.

Cochlea of the internal ear functions in hearing, while the vestibular apparatus helps to maintain body balance through transmitting impulses to the cerebellum.

41. What are the different receptors seen inside the vestibular apparatus ?
The cluster of receptors (hair cells) seen inside the utricle and sacule of the vestibule are immersed in a jelly substance and the sensory hair cells in the ampulla of the semicircular canals are also immersed in a jelly substance. All these receptors (hair cells) are stimulated according to the movement of head.
42. Cochlea : Hearing ; ---------- :Equilibrium of the body.
Vestibular apparatus (Vestibule and semicircular canals)
43. The swollen end of semicircular canals. Ans: Ampulla.
44. Cochlea : Auditory nerve : Cerebrum;
Vestibular apparatus : Vestibular nerve : …..... ? Ans: Cerebellum.
45. Hearing. Flowchart.
Sound waves → ear pinna → ear canal → ear drum (tympanum) vibrates → ear ossicles oval window → cochlear perilymph → endolymph → stimulation in auditory receptors of the basilar membrane → impulse transmitted through auditory nerve → auditory centre of the brain → hearing.
46. What is the role of ear in maintaining the equilibrium of the body ? How is it possible ?
Receptors (hair cells) seen inside the ampulla of semicircular canals, sacule and utricle are stimulated according to the movement of head. The impulses formed thus will be transmitted to the cerebellum through the vestibular nerve. Cerebellum functions so as to maintain the equilibrium of body.
47. Why giddiness is felt when you turn round and round ?
When we turn round continuously, the endolymph inside the semicircular canals and vestibule also moves and there will be continuous stimulation of the receptors and passing of impulses to the cerebellum. Hence cerebellum can not coordinates the muscular activities properly and we feel giddiness.
48. How do we sense taste ?
Chemoreceptors seen inside the mouth and tongue help us to detect taste. The chemoreceptors seen inside the papillae of the tongue are called as taste buds. Smell also influences taste.
49. The different taste buds of the tongue. Ans: Sweet, salt, sour and bitter. Other tastes are created by the brain from the primary tastes.
50. The projected structures seen on the tongue surface are known as ----------? Ans: Papillae.
51. Make a flowchart of sensing taste.

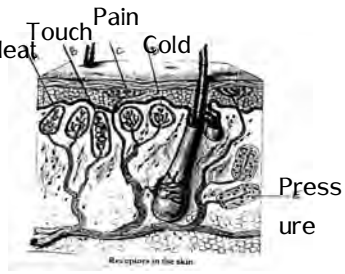


52. Recognize the figure A and B.


A

B

Ans: A. Taste bud B. Olfactory receptors.

53. How can we feel smell ?
When particles enter to the nose and disperse in the mucus, the olfactory receptors in the mucus membrane get stimulate and the impulses reach the brain through the olfactory nerve. Brain helps in the
54. The ability of shark to sense smell is sharp. Why?
Shark has highly sensitive olfactory receptors.
55. The largest sense organ ? Ans: Skin.
56. The stimuli that can be received by our skin ? Ans: Heat, Touch, Pain, Cold and Pressure
57. How skin perform as a sense organ ?
Heat, cold, touch, pressure and pain are felt by our skin. When these receptors are stimulated, impulses form and reach in the cerebrum for its perception.



58. The eyes of an insect consist of a cluster of photoreceptors called --------- ?
Ommatidia.
59. Housefly : Ommatidia Planaria : ---------- ? Ans: Eye spot.
60. The special olfactory organ seen in the mouth of snake ? Ans: Jacobson's organ.
61. How is the lateral lines important to the shark ?
The receptors in the lateral lines help to detect the change in the balance the body.

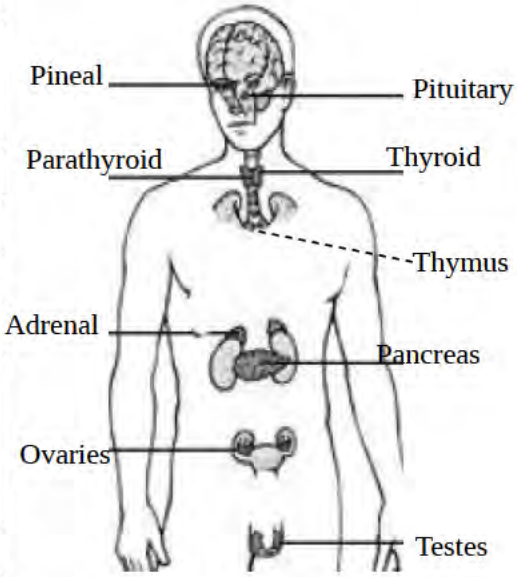
3. CHEMICAL MESSAGES FOR HOMEOSTASIS

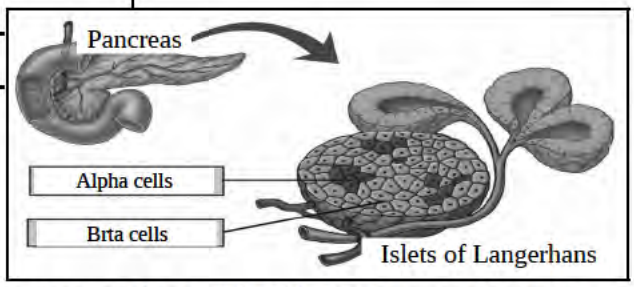
Homeostasis is maintained by the complementary activities of both quick neural system and slow hormonal system.

1. The chemical substances, secreted by the endocrine glands ?
   ⟶ **Hormones**.
2. Hormone secreting endocrine glands are also known as 'ductless glands'. Why ?
   The hormones secreted by these glands are discharged directly in to blood, not through particular ducts.
3. Though hormones reach all parts of the body, each hormone act at its own target cells. How is this possible?
   Though hormones reach all parts of the body through the blood stream, each hormone act only in its **target cells**, having specific receptors for accepting the same hormone. When hormone-receptor complex is formed in the plasma membrane, the enzymes in the cells become active.

4. The table and illustration showing the endocrine glands, site and producing hormones.

Endocrine glands	Producing hormones
*Hypothalamus	-Releasing hormones. -Inhibitory hormones, -Oxytosin, -Vasopressin(ADH)
Pituitary	-Tropic hormones (TSH, ACTH, GTH) -Somatotropin (STH/Growth hormone) -Prolactin
Pineal	-Melatonin.
Thyroid	-Thyroxine, -Calcitonin.
Parathyroid	-Parathormone.
Thymus	-Thymosine.
Adrenal	-Cortisol, -Aldosteron, -Sex hormones -Epinephrine (Adrenalin), -Norepinephrine (Noradrenalin)
Pancreas	-Insulin, -Glucagon.
Ovaries	-Estrogen, -Progesterone.
Testes	-Testosterone.

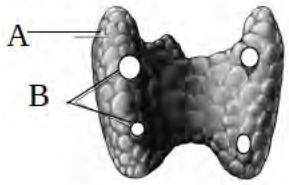




5. What is the normal level of glucose in blood ?
   Name the hormones which maintain this rate ?
   70 – 110 mg /100 ml blood.
   Insulin, Glucagon.
6. How is the normal blood glucose level maintained?
   This rate is maintained by the antagonistic activities of insulin and glucagon , released from Islets of Langerhans of the pancreas.
   When glucose increases in blood, beta cells in the Islets of Langerhans secretes **insulin**. It accelerates the process of glucose intake by the cells and conversion of the excess glucose in to glycogen.
   When glucose decreases in blood, alpha cells in the Islets of Langerhans secretes **glucagon**, which converts glycogen and amino acids in to glucose.

7. Islets of Langerhans : Alpha cells : Glucagon ;
   Islets of Langerhans : Beta cells : …..?
   ⟶ Insulin.

8. The reason for ----------, (the blood glucose level more than 126mg/100ml) is the deficiency or inactivity of the hormone insulin.
Diabetes mellitus /പ്രമേഹം. (Symptom : Increased appetite and thirst and frequent urination)
9. A test to detect the presence of glucose in urine ?
Benedict Test.
Take 2ml of urine in a test tube. Add 2ml of Benedict solution and heat for 2 minutes. We can understatnd the level of glucose by observing its colour change.
10. Patients having diabetes mellitus usually takes insulin injection. Why ?
Insulin maintains the normal rate of glucose in our blood.
11. World Diabetics Day ?
November 14.
12. Name the endocrine glands A and B shown in the figure.
A- Thyroid gland, B- Parathyroid gland.



13. The chief metabolic hormone ?
⟶**Thyroxine**.
14. The element needed for the proper functioning of thyroid gland ?
Iodine. (Deficiency of iodine may cause a disorder, **Goitre**, the abnormal growth of thyroid gland)
15. Mention the functioning of hormones secreted by thyroid gland.
Thyroxine – Increases the rate of metabolism and energy production, Accelerates the growth and development of brain in the foetal stage and infancy and also regulates growth in children.
Calcitonin – Maintains the level of calcium in blood by depositing excess calcium in bones or by preventing the mixing of calcium with blood.
16. Under secretion of thyroxine : Hypothyroidism,
Over secretion of thyroxine : ….....? ⟶Hyperthyroidism.

17. Deficiency of thyroxine during infancy may cause ---------, stunted physical-mental growth in children ?
⟶ **Cretinism**.
18. Deficiency of thyroxine in adults may cause --------- ? ⟶**Myxoedema**.

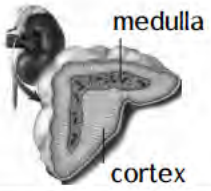
19. Symptoms seen in person with myxoedema (Hypothyroidism) ?
Low metabolic rate, sluggishness, increase in body weight, hypertension and inflammation in body tissues.
20. Symptoms seen in person having Hypothyroidism ?
High metabolic rate, rise in body temperature, excessive sweating, increased heart beat, weight loss and emotional imbalance.
21. Give examples for the conditions due to hyperthyroidism and hypothyroidism.
Hypothyroidism in children : Cretinism,
Hypothyroidism in adults : ----- ? ---- ⟶Myxoedema

22. The hormones which maintain the normal rate of calcium in our blood ?
Calcitonin of thyroid gland, Parathormone of parathyroid gland.
23. What is the normal level of calcium in blood ? How is it maintained ?
9-11 mg /100 ml blood.
When the level of calcium in blood increases, thyroid gland secretes **calcitonin**, which lowers the level of calcium in blood, by depositing excess calcium in bones or by preventing the mixing of calcium with blood (from the bones).
When the level of calcium decreases , parathyroid gland secretes **parathormone**, which increases the level of calcium by helping in its re-absorption from kidneys or by preventing the deposition of calcium in bones.

24.The endocrine gland that active during infancy ? Name its hormone ?
Thymus gland (situated below the sternum / chest bone). Secretes the hormone **thymosin**.

25. Thymosin is also known as the 'youth hormone'. Why ?
During infancy, thymosin helps in the maturation and activities of T-lymphocytes.
26.Name the gland that prepare our body to overcome emergencies.
Adrenal.

27. The outer part of adrenal gland : Cortex,
The inner part of adrenal gland : -------- ? ⟶Medulla.



28. Table which shows the functions of adrenal hormones.

Adrenal Cortex	**-Cortisol** : Synthesis of glucose from protein and fat, slows down the action of defense cells. and controls inflammation and allergy. **-Aldosterone** : Maintains the salt-water balance and also blood pressure. **-Sex hormones** : Controls the development and functions of sex organs.
Adrenal Medulla	**-Epinephrine** (Adrenalin): **-Norepinephrine** : (Noradrenalin) } Act along with the sympathetic nervous system in order to prepare body to overcome emergency situations.

29. Name the hormone that can be used as medicine against allergy and inflammation. Is it advisable to diabetic patients ? Why ?
Cortisol of the adrenal gland.
Since cortisol increases the synthesis of glucose, it is not advisable to diabetic patients.

30. How is epinephrine or norepinephrine prepare our body to overcome emergencies ?
When the sympathetic nervous system gets stimulated, the action of epinephrine or norepinephrine prolongs the body activities for more time. Due to these activities we get energy to resist or withdraw ourselves from such situations.

31. Why does the pineal gland, seen in the centre of our brain, called as a '**biological clock**' ?
Melatonin, the hormone of pineal gland, helps to maintain rhythm of our daily activities like sleeping, and waking up. So the pineal gland is called as a 'biological clock'.
(Melatonin also controls the reproductive activities of organisms that have definite reproductive periods)

32.Name the bilobed gland situated just below the hypothalamus.
Pituitary.

33.The hormones secreted by the anterior lobe of pituitary. Mention their functions too.

- **Tropic hormones**.
  - TSH (Thyroid stimulating hormone)- Stimulates the activity of thyroid gland.
  - ACTH (Adreno cortico tropic hormone)- Stimulates the activity of adrenal cortex.
  - GTH (Gonado tropic hormone)- Stimulates the activity of sex organs.
- STH (**Somato tropic hormon** /GH -Growth hormone)- Promotes the growth of the body.
- **Prolactin** – Production of milk.

34.Hormones which are stored in the posterior lobe of pituitary ? Their functions ?

- **Oxytocin** - Facilitates child birth by stimulating the contraction of smooth muscles in the uterine wall
  - Facilitates lactation .
- **Vasopressin** - Helps in the re-absorption of water in the kidneys and thus act as Anti Diuretic hormone (ADH). Thus, it regulates the level of water in the body.

35.Name the hormones of hypothalamus.
Releasing and Inhibitory hormones (towards the anterior lobe of pituitary to stimulate hormone production).
Oxytocin and vasopressin orADH (towards the posterior lobe of pituitary)

36. How can hypothalamus control the entire endocrine system ?
Through the releasing and inhibitory hormones, hypothalamus induce the anterior lobe of pituitary to produce various tropic hormones, which in turn stimulate certain other endocrine glands.
(Releasing hormones stimulate hormones production of the pituitary, but inhibitory hormones suppress the production of hormones from pituitary).

37. What are the tropic hormones ?
Tropic hormones are stimulating hormones of pituitary to control the production of hormones of certain other glands.
TSH, ACTH, GTH are tropic hormones.

38. Why is the hypothalamus considered as the 'chief controller' of endocrime system ?
Through the releasing and inhibitory hormones, hypothalamus induce the pituitary to produce tropic hormones, which in turn stimulate certain other endocrine glands.

39. Name the growth disorders related to the growth hormone (somatotropin / STH) of the pituitary.
Dwarfism - The condition characterised by stunted physical growth due to decreased production.
Gigantism – Excessive growth of the body due to increased production of Somato Tropic Hormone.
Acromegaly – Excessive growth of the bones on face, jaws and fingers due to the prolonged production of STH even after the growth phase.

40. Mention the symptoms of acromegaly.
Excessive physical growth with excessive growth of the bones on face, jaws and fingers.

41. Describe about the reason for decreased production of urine during summer season.
During summer season, the production of vasopressin(ADH) increases and there fore re-absorption of water in the kidneys increases, to lower the quantity of urine.

42. The condition in which excess amount of urine is excreted, even in summer season, due to the insufficient production of vasopressin, is known as ---------- ?
Diabetes insipidus .

43. Insulin : Diabetes mellitus : Glucose,
Vasopressin : --------?---------- : water. ⟶ Diabetes insipidus.

44. Table showing sex organs, hormones and their functions.?

Sex organs	Hormones	Functions
Testis	**Testosterone**	Controls secondary sexual characters (change in voice, growth of hair, development of reproductive organs) and sperm production.
Ovaries	**Estrogen**	Controls secondary sexual characters, ovulation, menstrual cycle etc.
	Progesterone	Controls ovulation, menstrual cycle and implantation of embryo in the uterus.

45. Hormonal disorders.

Goitre	Abnormal growth of thyroid lobes [bulged throat] due to iodine deficiency.
Cretinism	Retarded physical – mental growth in children, due to hypothyroidism during early period of growth.
Myxoedema	Inflamed condition of body in adult due to deficiency of thyroxine.
Dwarfism	Stunted growth of bones due to under secretion of somatotropin in children.
Gigantism	Growing tall and heavy due to over secretion of somatotropin in children.
Acromegaly	Excessive growth of the bones on face, jaws and fingers due to the prolonged production of somatotropin even after the growth phase.
Diabetes mellitus	The condition of excessive loss of glucose through urine due to deficiency or inactivity of insulin.
Diabetes insipidus	The condition of excessive loss of water through urine due to deficiency of vasopressin /ADH.

46. Define pheromones. How is it useful to animals ?
Pheromones are chemical substances that are secreted by certain animals to the surroundings to facilitate communication.
It help in attracting mates, informing about food, determining the path of travel, signalling dangers, help honey bees and termites to live in colonies etc.

47. Give examples of pheromones

The **musk** in the musk deer,

The **civeton** in civet cat ,

Bombycol in female silkworm .

48. Ants can follow one after another during their trail. How is this possible ?

Because of the chemicals, *pheromones*, that released to their surroundings.

49. How are pheromones helpful in agricultural fields ?

Pheromone traps are used for pest control in agricultural fields.

50. How the life activities are controlled and coordinated in plants ?

Certain plant hormones (plant growth regulators) control and coordinate life activities in plants.

51. Table showing the natural plant hormones and their activities.

Plant hormones	**Activities**
Auxin	Cell growth, cell elongation, promoting terminal buds growth, fruit formation.
Cytokinin	Cell growth, cell division, cell differentiation.
Gibberellin	Stimulates break down of stored food to facilitate germination, sprouting of leaves
Ethylene	Ripening of leaves and fruits, excess amount causes dropping of leaves and fruits.
Abscisic acid	Dormancy of embryo, dropping of ripened leaves and fruits.

52. Name the plant hormone in gaseous form.

Ethylene.

53. The uses of artificial or synthetic plant hormones in agricultural sector.

Auxins	-To prevent the dropping of premature fruits, for the sprouting of roots and as a weedicide.
Gibberellins	-For increasing fruit size in grapes and apple and also for preventing ripening of fruits to assist marketing.
Ethylene	- Used for the flowering of pineapple plants at a time and for the ripening of tomato, lemon, orange etc. **Ethyphon**, a liquid chemical gets transformed into ethylene, when used in rubber trees and it increases the production of latex.
Abscisic acid	- Used for harvesting fruits at the same time.

54. Give examples of situations where artificial plant hormones are applied .

Ethylene is used for the flowering of pineapple plants at a time and for the ripening of tomato, lemon, orange etc.

Ethyphon, in liquid form gets transformed into ethylene, increases the production of latex.

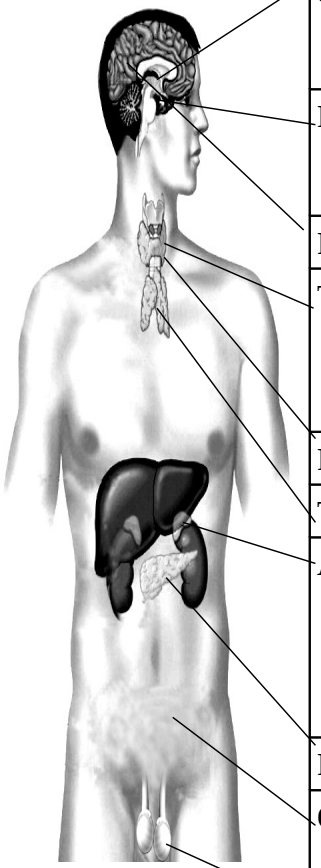
Gibberellins are used for increasing fruit size in grapes and apple and also for preventing ripening of frutis to assist in marketing.

55. Though artificial plant hormones are useful, its application should be with utmost care. What is your opinion ?

True. Majority of the synthetic plant hormones are strong chemicals.

Video class links of this chapter:
PART -1 : https://youtu.be/ZtbtMBeUFqs
PART -2 : https://youtu.be/Mt2aHAjAcPU
PART -3 : https://youtu.be/35TgLaBqHyk

3. CHEMICAL MESSAGES FOR HOMEOSTASIS



Endocrine Glands	Producing hormones	Functions	Related disorder
'Hypo thalamus'	1. Releasing hormones. 2. Inhibitory hormones, 3. Oxytosin, 4. Vasopressin(ADH)	- Stimulates pituitary to secrete hormones - Inhibits the production of hormones from pituitary - Facilitating child birth, ejection of breast milk - Reduces water loss through urine	- - - - Diabetes insipidus
Pituitary	1. Tropic hormones - **TSH, ACTH, GTH** 2. STH (Growth hormone-GH) 3. Prolactin	- Stimulate thyroid, adrenal glands and sex organs. - Promotes the growth of the body. - Production of breast milk.	- -Dwarfism, Gigantism, - Acromegaly
Pineal	Melatonin.	- Maintain rhythm of our daily activities	-
Thyroid	1.Thyroxine 2. Calcitonin.	- Increases the rate of metabolism, energy production, accelerates the development of brain in the foetal stage and infancy and regulates growth in the children. - Maintains the level of calcium in blood (decreases)	- Cretinism, Myxoedema, Grave's disease -
Parathyroid	Parathormone.	- Maintains the level of calcium in blood (increases)	-
Thymus	Thymosine.	- Helps in the maturation and activities of lymphocytes	-
Adrenal	1. Cortisol, 2. Aldosteron, 3. Sex hormones, 4. Epinephrine / Adrenalin 5. Norepinephrine / Noradrenalin	- Glucose production, Prevent inflammation and allergy - Maintains the salt-water balance. - } Act along with the sympathetic nervous system in order to prepare the body to overcome emergency situations.	- - - - -
Pancreas	1. Insulin 2. Glucagon.	- Maintain the normal rate of glucose in our blood	-Diabetes mellitus
Ovaries	1. Oestrogen 2. Progesterone.	- Growth of sex organs, ovum production, ovulation etc. - Ovulation, menstrual cycle, implantation of embryo.	-
Testes	Testosterone.	- Growth of sex organs, sperm production etc. in males.	-

Pheromones
(To facilitate communication among organisms)
* **Musk** in the musk deer,
* **Civeton** in civet cat ,
* **Bombycol** in female silkworm

Plant Hormones	
1. Auxins	- Cell division, cell growth, cell elongation, cell differentiation growth of terminal bud, fruit formation etc. [Inhibits the growth of roots]
2. Cytokinins	- Cell division, cell growth, cell elongation, cell differentiation etc.
3. Gibberellins	- Cell elongation, breakdown of stored food in the seed, flowering, growth of leaves,fruits
4.Ethylene	- Ripening of fruits [Excess amount causes dropping of leaves or fruits]
5. Abscisic acid	- Dormancy of embryo in the seeds, dropping of leaves and fruits, wilting of leaves, flowering.

Synthetic Plant Hormones

- NAA, IBA, 2,4-D
- Gibberellins
- Ethylene
- Ethyphon
- Abscisic acid

Rasheed Odakkal, GVHSS Kondottv

4. KEEPING DISEASES AWAY

CONTENT

* Communicable diseases, Pathogens
* Dengue fever, AIDS, Tuberculosis, Malaria, Filariasis, Ringworm, Athlets' foot :
  – Mode of spread and symptoms.
* Genetic diseases – Haemophilia, Sickle cell anaemia.
* Cancer.
* Life style diseases.
* Consequences of smoking.
* Diseases affecting domestic animals.
* Plant diseases.

Video class link of this chapter :

Part 1 : https://youtu.be/-qKvdUewTs8
Part 2 : https://youtu.be/0nq8LEbV4fw
Part 3 : https://youtu.be/zM3UAvzf1Io

QUESTIONS & ANSWERS

1. Give examples to the micro organisms that cause diseases. How do they cause diseases?
   A few virus, bacteria, fungus and protozoa are examples for pathogens.
   *VIRUS - By undertaking the genetic control of the host cell , multiply and thus destroy the cell.
   * BACTERIA – They multiply through cell division and the toxins released by metabolism kill or disrupt the living cells.
   * FUNGUS – The toxins produced by them cause diseases.
   * PROTOZOA – Their toxins destroy the cells. Some of them destroy blood cells.

2. List out some viral diseases. How are these transmitted ?

Viral diseases	Mode of invasion
* AIDS, Ebola * SAARS, Chickenpox * Chikungunya, Dengue fever * Rabies	- through body fluids - through air - through mosquitoes - through other animals

3. Define AIDS ?
   AIDS (Acquired Immuno Deficiency Syndrome) is a condition of a gradual decrease of immunity by the destruction of lymphocytes by HIV (Human Immunodeficiency Virus).
   Any pathogen can act in such condition, is a dreadful situation.

4. What are the ways by which HIV spreads ?
   - Through body fluids.
   - By sharing needle and syringe used by HIV affected persons.
   - Through unprotected sexual contact.
   - From HIV infected mother to her foetus.


HIV

5. What are the precautions that can be taken against the infection of HIV ?
   - Conduct HIV test before receiving blood from a donor.
   - Do not share needle and syringe already used by others.
   - Have safety in sexual relationship.

6. Name the diseases spread by the mosquitoes.

Disease	Pathogen	Vector of pathogen
Dengue fever	Virus	Aedes mosquito
Chikungunya	Virus	Aedes mosquito
Malaria	Protozoa	Anopheles mosquito
Filariasis	Filarial worm	Culex mosquito

7. Point out certain preventive measures for mosquito diseases.
   - Avoid circumstances leading to the multiplication of the mosquitoes.
   - Observe 'Dry Day' once in two weeks.
   - Keep our surrounding neat and clean.
   - Practice the use of measures like mosquito net.

8. List out some bacterial diseases. How are these transmitted ?

Bacterial diseases	Mode of invasion
* Cholera, Typhoid	- through contaminated water
* Tetanus	- through wounds
* Tuberculosis	- through air
* Gonorrhoea, Syphilis	- through sexual contact
* Anthrax	- through contact with animals
* Botulism	- through stale food

9. An air borne bacterial disease that affects mainly the lungs ? Name the pathogen.
   Tuberculosis. Pathogen is Mycobacterium tuberculosis.
10. Common symptoms of tuberculosis ?
   Loss of body weight, fatigue and persistent cough.
11. The vaccine, ----------, is used against tuberculosis.
   BCG vaccine.

12. Name a bacterial disease that can be spread from cattle.
   Anthrax.

13. What is botulism ?
   Botulism is a dangerous food poisoning due to the growth of certain bacteria in stale food.

14. Table showing fungal diseases, symptoms and mode of infection.

Fungal diseases	Symptoms	Mode of infection
* Ringworm	- Round, red blisters on the skin	- through contact
* Athletes' foot	- Reddish scaly rashes that cause itching on the sole of the foot and between the toes	- through contact with contaminated water and soil

15. The organisms that cause malaria ?
   The protozoa, 'plasmodium'.

16. The worms that cause filariasis ?
   Filarial worms.

17. Comparison of mosquito spreading diseases , Malaria and Filariasis.

	Malaria	Filariasis
Pathogen	Protozoa (plasmodium)	Filarial worms
Vector	Anopheles mosqitoes	Culex mosquitoes
Symptoms of disease	High fever with shivering, profuse sweating, headache...	Swelling in the lymph ducts in legs by the obstruction in the flow of lymph.

18. Define communicable (contagious) diseases.
   Communicable diseases are diseases caused by the invasion of pathogens and are transmitted from person to person.

19. Communicable diseases which can be affected to human beings.

Disease	Causative	Mode of spread	Symptoms ലക്ഷണങ്ങള്	Control measures
Dengue fever	Virus [Dengue virus]	Through aedes mosquitoes	Fever, pain at joints and muscles	Mosquito control
AIDS	HIV [Human Immunodeficiency Virus]	Through body fluids	Gradual decrease of immunity.	Blood test, single syringe, safety in sexual contact
Tuberculosis	Bacteria [Mycobacterium tuberculosis]	Through air	Loss of body weight, fatigue and persistent cough.	BCG vaccination
Ringworm	Fungus	Through contact	Round, red blisters on the skin	Personal cleanliness
Athletes' foot	Fungus	Through contact of soil or water	Reddish scaly rashes that cause itching on the sole of the foot and between the toes	
Malaria	Protozoa [Plasmodium]	Through anopheles mosquitoes	High fever with shivering, profuse sweating, headache...	Mosquito control
Filariasis	Filarial worms	Through culex mosquitoes	Swelling in the lymph ducts in legs by the obstruction in the flow of lymph.	

20. Give examples for non pathogenic or non communicable diseases.
Lyfestyle diseases – Cancer, Diabetics, Stroke, Fatty liver, Hypertension.
Genetic diseases – Haemophilia, Sickle cell anaemia.
Deficiency diseases – Anaemia, Goitre, Marasmus, Kwashiorker.
Occupational diseases- Silicosis, Asbestosis, Pneumoconiasis.

21. Differentiate between anaemia and sickle cell anaemia.
* Anaemia is a condition characterized by tiredness or weakness of the body and decreased oxygen transport due to the deficiency of iron.
* Due to the defect of genes, deformities occur in the sequencing of amino acids of haemoglobin, and RBCs become sickle shaped. As a result, oxygen carrying capacity of red blood cells decreases. Such patients will be anaemic and weaken.

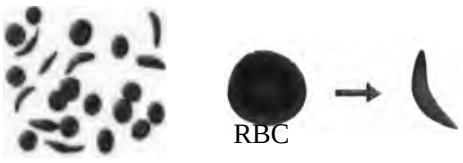
22. What is haemophilia ?
Excessive bleeding even from small wounds as blood does not clot, due to defective synthesis of one of the proteins that enables blood coagulation.

23. Comparison between haemophilia and sickle cell anaemia.

	Haemophilia	Sickle cell anaemia
Cause	Due to defect of genes, defective synthesis of one of the proteins that enables blood coagulation.	Due to the defect of genes, deformities occur in the sequencing of amino acids of haemoglobin, and RBCs become sickle shaped.
Symptoms	Excessive bleeding even from small wounds as blood does not clot	Oxygen carrying capacity of red blood cells decreases. Such patients will be anaemic and weaken.

24. World haemophilia day ?
April 17.

25. What does the figure indicate ?
Sickle cell anaemia.



26. What is cancer ? What are the circumstances that lead to cancer ?

Cancer is the condition by which uncontrolled division of cells and their spread to other tissues occur.

Environmental factors, smoking, radiations, viruses, hereditary factors and alterations in genetic material may lead to the transformation of normal cells in to cancer cells.

27. How is smoking injurious to our health ?

Smokers and tobacco users are not only subjected to cancer but also affected diseases to brain, lungs and heart. The defects include stroke, addiction to nicotine, bronchitis, emphysema, hypertension, loss of elasticity of arteries and decreased functioning of heart.

28. Prepare slogans against the habit of smoking.

- Quit smoking, it kill you ...
- Abandon the habit of smoking to prevent cancer.

29. Identify certain means of cancer treatment.

Surgery, chemotherapy, radiation therapy etc.

30. ' Life style diseases are caused by our unhealthy living style'. Substantiate.

The changes in food habits (synthetic food items, fast food etc) lack of physical exercise, mental stress, bad habits like consumption of alcohol, drug abuse or smoking etc. may result life style diseases.

	Life style diseases	**Causes**
a	Diabetes	Deficiency or malfunction of insulin
b	Fatty liver	Deposition of excess fat in the liver
c	Stroke	Rupture of blood vessels or block of blood flow in brain
d	Hypertension	Thickening of artery wall by fat deposition
e	Heart attack	Block of blood flow due to fat deposition in the coronary arteries

31. The life style habits that can be adopted to prevent from heart diseases ?

- Avoid the use of fatty and salty food.
- Control diabetes and hypertension.
- Take measures to reduce mental stress.
- Abandon the habits of smoking and alcohol consumption.
- Proper exercise.

32. “Both diabetes and hypertension are silent killers”. Why ?

Diabetes and hypertension increase the risk of stroke, heart diseases or damage to kidneys. Hence these diseases are known as the 'silent killers'.

33. Table of diseases affect the domestic animals with category of pathogens and symptoms of diseases.

Foot and mouth disease	Virus	High fever, blisters in mouth and feet, loss of weight.
Anthrax	Bacteria	Sudden fever, diarrhoea, mouth sore,
Inflammation of udder	Bacteria	Swelling of udder, decreases milk production.

34. List out diseases that are common in plants. Name the category of pathogen of each.

Blight disease of paddy, Wilt disease of brinjal	-Bacteria
Mosaic disease in peas and tapioca, Bunchy top of banana	- Virus
Quick wilt in pepper, Bud rot of coconut	- Fungus

Kerala **Class 10**

Part 2

Simplified Notes

English Medium

Volume : 2

Units :

Prepared by

Rasheed Odakkal

2021

5. SOLDIERS OF DEFENSE

CONTENT

* Defense by body coverings, body secretions and body fluids.
  WBCs in non-specific defense.
  Defense mechanisms (Inflammatory response, Phagocytosis, Blood clotting, Healing, Fever)
* Specific defense - Actions of B and T-lymphocytes.
* Vaccines for induced immunity.
* Popular systems of treatment – Allopathy, Ayurveda, Homeopathy, Unani, Sidha etc.
* Techniques for the diagnosis of diseases – Equipments, Lab test etc.
* Antibiotics.
* Blood groups and blood transfusion.
* Defense mechanisms in plants (-structural & biochemical)

QUESTIONS & ANSWERS

1. Defense ?
   Defense is the ability of the body to prevent the entry of pathogens and to destroy those that have already entered the body.
2. Defense mechanisms in our body ?
   - Body coverings (Skin and mucous membrane)
   - Body secretions (Mucus, lysozyme in saliva, tears and urine, sweat, sebum, ear wax, HCl …)
   - Body fluids (Blood and lymph)
3. 'Our skin is referred as a fort of defense'. How?
   The outer epidermis of the skin have a protein called **keratin**, prevents germs from entering it.
   Sebum, produced by the sebaceous glands makes skin oily and water proof.
   Sweat, produced by the sweat glands have disinfectants to destroy germs.
   Skin also contain useful bacteria, which indirectly prevent germs.
4. How mucous membrane protects our body ?
   Mucous membrane secretes **mucus** where germs trapped and get destroyed. The destroyed germs are expelled out by the cilia cells of the mucous membrane. It also contain useful bacteria.
5. Many useful bacteria seen in our body also prevent germs. How ?
   The germs that enter the body get destroyed during the competition with the useful bacteria.
6. Table showing various secretions to defend pathogens in different body parts.

Body part	Secretion
Eye	- Lysozyme in tears
Ear	- Ear wax
Nose, Trachea	- Mucus
Mouth	- Lysozyme in saliva
Stomach	- HCl in gastric juice
Intestines	- Mucus
Urinary bladder	- Lysozyme in urine

7. The main warriors of the body ?
   White blood cells (Monocytes, Basophils, Neutrophils, Eosinophils and Lymphocytes)
8. The real warriors among white blood cells ?
   Lymphocytes (B-lymphocytes and T-lymphocytes)

9. Examples for certain natural defense mechanisms of our body, to prevent or destroy germs ?
   Inflammatory response, Phagocytosis, Blood clotting, Healing of wounds, Fever..

10. The role of white blood cells ?

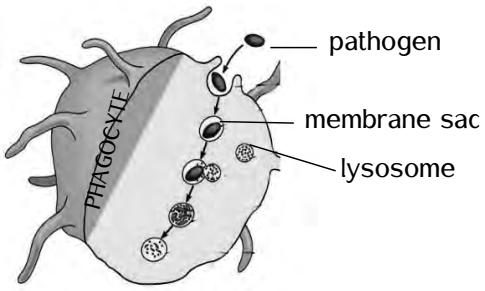
	Neutrophil	Engulfs bacteria, Synthesizes chemicals to destroy bacteria
	Basophil	Stimulates the other white blood cells, Dilates the blood vessels.
	Eosinophil	Synthesizes chemicals to destroy foreign bodies. Synthesizes chemicals for inflammatory response.
	Monocyte	Engulfs and destroys germs.
	Lymphocytes (B & T)	Identifies and destroys germs specifically

11. Inflammatory response is a kind of defense mechanism. What is inflammatory response ?
The dilation of the blood vessels by certain chemicals, when germs enter through wound, is termed as inflammatory response.

12. What is the advantage of dilation of blood vessels (inflammation) at the wound site ?
When inflammation occur, blood flow increases to the wound site and more plasma and white blood cells can reach easily there. WBC can come out from blood vessels. Germs can be engulfed and destroyed there.

13. What is phagocytosis ?
Phagocytosis is the process of engulfing and destroying germs by certain white blood cells (phagocytes).

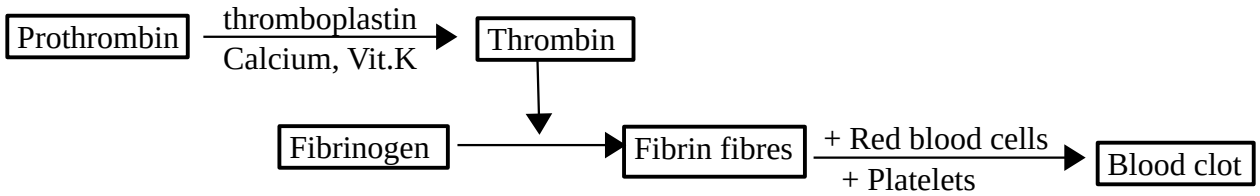
- Phagocyte reach near the pathogen.
- Engulfs the pathogen in the membrane sac.
- Membrane sac combines with lysosome.
- The enzyme in the lysosome destroys the pathogen.
- Phagocyte expels the remnants.



14. Give examples for phagocytes.
Monocytes and neutrophils.

15. The factors needed for blood clotting ?
The proteins prothrombin and fibrinogen in plasma, calcium ions, vitamin K, RBC and platelets.

16. Different stages in the process of blood clotting.
- Tissues of the wounded part degenerate to form an enzyme, **thromboplastin**.
- With calcium ions and vitamin K, thromboplastin converts prothrombin to **thrombin**.
- Thrombin converts fibrinogen to **fibrin**.
- In the fibrin net, RBCs and plateletes entangled to form the blood clot.



17. In certain situations, wound scar remains there. Why ?
Instead of forming same new tissues, connective tissues form which heal the wound. In such situations the wound scar remains there.

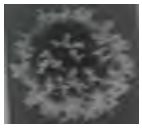
18. Bacterial diseases are common in man. Give reason.
Our body temperature, 37^0 C (98.6^0 F), is favourable for the rapid multiplication of bacteria.

19. 'Fever is not a disease, it is mere a defense mechanism.' - Analyse the statement.
True. Our body raises temperature (fever) when chemical substances are produced by the white blood cells, which are stimulated by the toxin of pathogens.

20. What is specific defense ?
The defense mechanism that identifies the structure of each antigen and destroys it specifically is called specific defense.

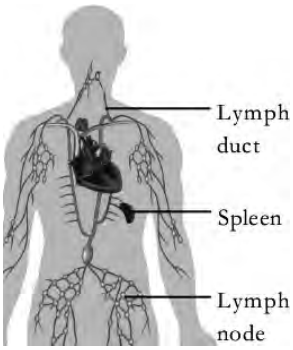
21. What are antigens ?
Antigens are foreign bodies or pathogens that enter the body and stimulate the defense mechanism.

22. B-lymphocytes : Mature in the bone marrow;
T-lymphocytes : ---------- ? [Mature in the thymus gland]

23. Name the chemical substances, produced by B-lymphocytes against foreign bodies/antigens.
How these substances destroy germs ?

Antibodies.
They destroy germs by disintegrating tbacterial cell membrane, neutralise their toxins and stimulate the other white blood cells.

24. How is T-lymphocyte destroy germs ?

T-lymphocytes stimulate the other white blood cells and destroy cancer cells as well as virus affected cells.



25. How lymph helps in defense mechanisms ?
Lymphocytes in the lymph destroy bacteria with in the **lymph nodes** and **spleen**.

26. What are vaccines ?
Vaccines are substances used for artificial immunization.
Vaccines are used to prevent certain diseases in advance. A vaccinated person gets induced immunity by the formation of antibodies in his body in advance.

27. Who started **immunization** ?

Doctor Edward Jenner.
[Smallpox vaccine , the first vaccine, was invented by him]

[The immunization programmes got the name vaccination from the Latin word '*vacca*' meaning cow, in memory of the cowpox experiments of Jenner.]

Vaccine	Disease
BCG	Tuberculosis
OPV	Polio
Pentavalent	Diphtheria, Pertussis, Tetanus Hepatitis-b, Hib
MMR	Mumps, Measles, Rubella
TT	Tetanus

BCG= Bacillus Calmette-Guerin
OPV= Oral polio vaccine
Hib= Haemophilus influenza -type b
TT= Tetanus toxoid

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28. How do vaccines induce immunity ?
Dead, inactive, alive but neutralized germs or toxins are used as vaccines.
By the presence of these antigens, lymphocytes become activated and produce antibodies.
These antibodies remain in the body for long time to provide immunity against such antigens.

29. Give examples for a few popular systems of treatment in the world.
Allopathy, Ayurveda, Homeopathy, Unani, Naturopathy, Siddavaidya, Panchakarma …..

System	Founding fathers	Special features
Ayurveda	Charaka, Susrutha, Vagbhada … (Indian)	A life style to maintain the body fit. Medicines are herbal, but a few are animal products.
Homeopathy	Samuel Hahniman (German)	Great concern for symptoms. Homeopathy considers the causative factor can itself effect the cure and when medicine is more diluted the more is its potency.
Allopathy-Modern medicine	Hippocrates (Greek)	Gives much importance to diagnosis, treatment, medicines etc. Different areas of specialisation, Modern equipments or instruments for treatment....
Unani	Hippocrates, Galan, Razi, Ebnuseena (Greek, Arabian)	When the stability of the four body fluids (namely blood, sputum, dark and yellow bile) alters, disease occur in that body. Herbal medicines are used.

30. Give examples for equipments or means used for diagnosis.
Lab test and equipments like stethoscope, thermometer, sphygmomanometer , ECG, EEG and scanners.

.



A. Stethoscope B. Thermometer C. Sphygmomanometer (to measure BP).

31. Electrocardiogram (ECG) : to record electric waves in the heart muscles;
--------- ? ---------- : to record electric waves in the brain.
Electroencephalogram (EEG).

32. Different types of scanners and their uses in the diagnosis of disease.
Ultra sound scanner - to understand the structure of internal organs using ultrasonic sound waves.
CT (Computerised Tomography) scanner - to get 3D visuals of internal organs with the help of computer, using X-rays.
MRI (Magnetic Resonance Imaging) scanner - to get 3D visuals of internal organs using radio waves and magnetic field.

33. Normal value of blood cells and haemoglobin in our blood.
Haemoglobin – 12-17gm/100ml of blood.
RBCs count - 45-60 lakhs/ml of blood.
WBCs count – 5000-10000/ml of blood.
Platelets count – 2.5-3.5 lakhs/ml of blood.

CBC= Complete Blood Test

34. A doctor suggested one of his patients to test his blood for platelet count. What might be the reason ?
To know whether the patient is affected by dengue virus, which prevent the formation of platelets from the bone marrow. There will be considerable decrease in the number of platelets in dengue fever patients.

35. Examples for specialisations in modern medicines.
Cardiology – (treatment of heart)
Ophthalmology - (treatment of eye)
Neurology - (treatment of brain or nerves)
Oncology - (treatment of cancer)
E.N.T - (treatment of ear, nose and throat)

36. Define: * Antigen * Antibody * Antibiotics
Any foreign body that stimulates the defense system is called as an antigen.
Antibodies are chemical substances, produced by the B lymphocytes against antigens.
Antibiotics are medicines that are extracted from microorganisms like bacteria, fungi, etc. and used to destroy bacteria.

37. Different kinds of medicines against microorganisms ?
Antibiotics against bacteria.
Antifungal medicines against fungi.
Antiviral medicines against viruses.

38. The first antibiotics (penicillin)was synthesized by ---------- ?
Alexander Fleming (in 1928 from a fungus, *penicillium notatum.*)

39. Though antibiotics are useful medicine, its use should be with great care. Why ?
- Regular use develops immunity in pathogens against antibiotics.
- Destroy useful bacteria in the body.
- Reduces the quantity of certain vitamins in the body.

40. What is **blood transfusion** ? Give example for instances that need blood transfusion.
Blood transfusion is the transfer of blood from one person to other. It can be done in the situations like heavy loss of blood in accidents, surgical operations and in the treatment of blood cancer.

41. What all things should be taken care of while transfusing blood?
Healthy people in the age 18-60 can donate blood, once in 3 months.
Pregnant and breast feeding women as well as person with communicable disease should not donate blood.
Prior to blood transfusion, blood group testing is necessary.

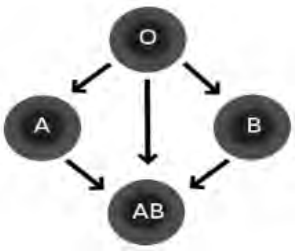
42. Name the major blood groups.
A, B, AB, O
[Carl Landsteiner proposed blood grouping on the basis of A, B antigens seen on the surface of RBC]

43. On what basis, blood groups are called as positive or negative ?
Those blood with Rh factor (antigen D) on the surface of RBC are termed as positive group blood and those with out Rh are termed as negative group blood.

44. Why is that not possible to receive blood from all persons ?
If blood is not compatible, the antigen in the received blood will react with the antibody in the recipient's blood of so as to clot RBC (agglutination).

45. Table showing different blood groups, antigen, possible antibody and group that can receive the blood.

Blood gr	Antigen present	Antibody	Whom can receive each
A	A	Anti-b	A, AB
B	B	Anti-a	B, AB
AB	A, B	--	AB
O	--	Anti-a, Anti-b	A, B, AB, O



46. Prepare apt slogans to encourage blood donation.
Blood donation is life donation.
You can save a valuable life, through donating your blood.
Donating blood is not harmful to our health, instead it is a noble deed.

47. Defense mechanisms in plants ?
Structural:- - Wax covering and Cuticle on leaves (prevents entry of germs through leaves).
- Bark (protects the inner cells from direct contact of pathogens)
- Cell wall (serve as a well equipped resistant coat).
Biochemical:- - Lignin, cutin, suberin etc. strengthen the cell wall.
- **Callose**, a poly saccharide formed in cell wall prevents the germs which have crossed the cell wall.

48. Examples for a few chemical substances that strengthen the cell wall ?
Lignin, cutin or suberin.

Video class links of chapter 5 : **Part 1** - https://youtu.be/bgvdOC8yB48
Part 2 - https://youtu.be/Rc3Tw2YGakY **Part 3** - https://youtu.be/a0Uq1zstbXA

6. UNRAVELLING GENETIC MYSTERIES

CONTENT

* Genetics -Heredity and Variations
* Experiments and inferences of Gregor Johann Mendel
* Nucleic acids - DNA, RNA -structure
* Nucleotides, Genes and Alleles
* Gene action (protein synthesis)
* Autosomes & Sex chromosomes
* Sex determination
* Variations – Crossing over, fertilization & Mutation.

1. What is genetics (Hereditary science) ?

Genetics is the branch of science which deals with heredity and variations.

2. What do you mean by Heredity and Variations ?

Heredity is the transmission of characters from parents to their offsprings.

Variations are the features seen in offsprings that are different from their parents.

3. Who is known as 'the Father of Genetics' ? Why is he known as so ?

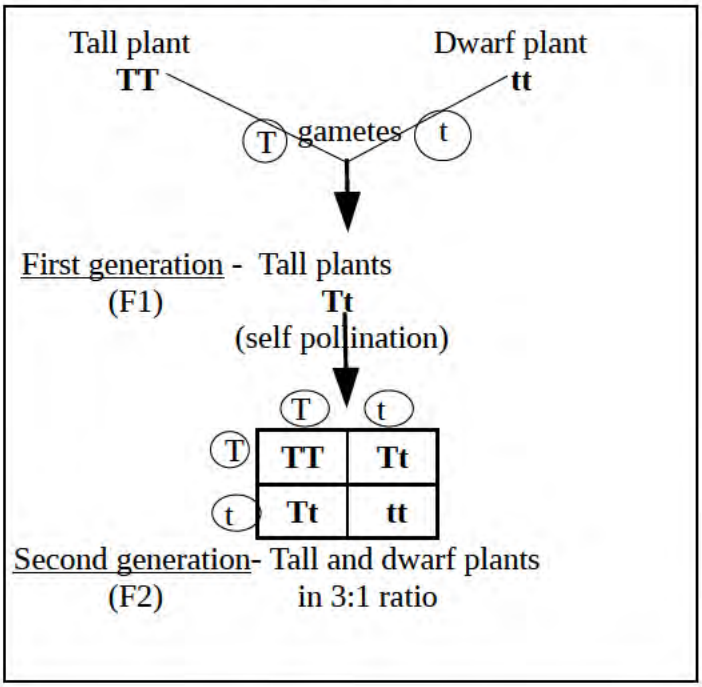
Gregor Johann Mendel.

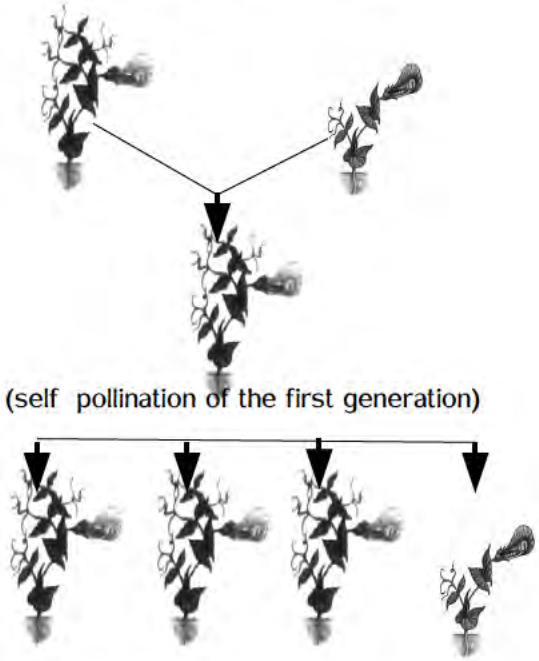
The inferences from his hybridization experiments in pea plants (*Pisum sativum*) from 1856 to 1863 led to the foundation of Hereditary science or Genetics.

4. What were the traits considered by Gregor Mendel for his hybridization experiments in pea plants ?

- Height of the plant (tall/dwarf)
- Position of the flower (axial/terminal)
- Shape of the seed (round/wrinkled)
- Colour of seed coat
- Colour of cotyledon
- Colour of fruit
- Shape of fruit.

5. Mendel's experiment on pea plants considering one pair of contrasting traits: (tallness-dwarfness)





6. What, according to Mendel, the terms dominant trait and recessive trait are referred to ?

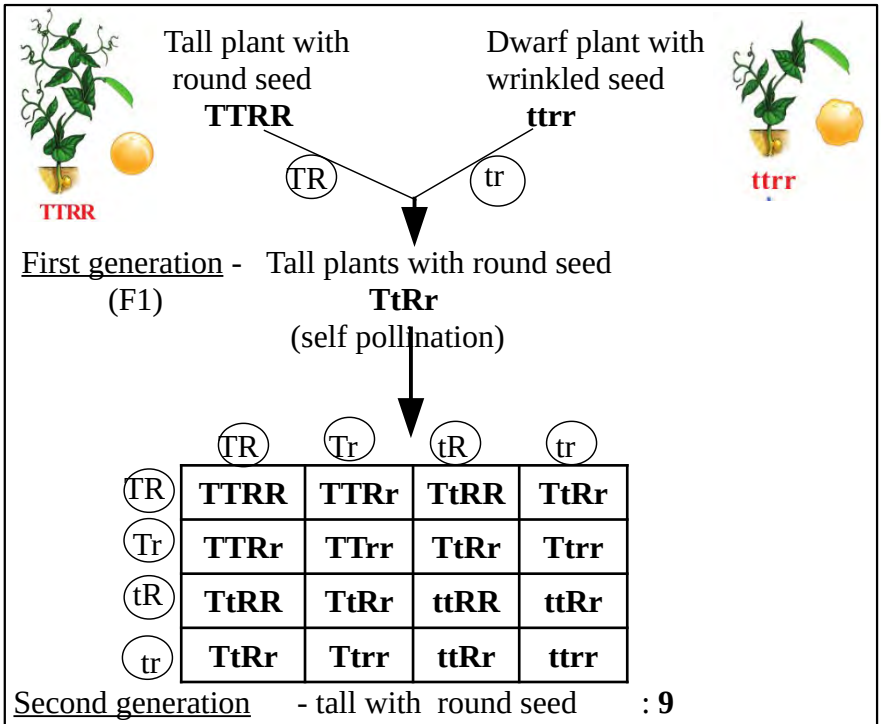
The expressed character, out of the two factors of a particular trait, is known as **dominant trait** and the other factor which remains hidden, is known as **recessive trait**.

For example, if 'Tt' are the two factors of the trait 'height', the "T" is dominant trait and 't' is recessive trait.

7. When Gregor Mendel conducted experiments considering one pair of contrasting traits, the plants obtained in the second generation were always in ---------- ratio.
3:1 [Out of 1064 plants got in F2, 787 were tall and 277 were dwarf. Approximate ratio is 3:1]

8. The main <u>inferences of Gregor Mendel</u> that paved the way for the emergence of Genetics ?
- A trait is controlled by the combination of two factors.
- One trait is expressed (dominant trait) and the other remains hidden (recessive trait) in F1 generation.
- The trait which remains hidden in the first generation appears in the second generation.
- The ratio of the dominant and recessive traits in the second generation is 3:1 .

9. Illustration of Mendel's experiment considering two pair of contrasting traits:
(tallness-dwarfness and round-wrinkled seeds)



When considering two pair of contrasting traits, the ratio in the F2 will be 9:3:3:1

10. The hereditary factors, first described by Gregor Mendel, are now known as ------ ?
Genes.

11. Define the term 'genes'.
Genes are the specific parts of DNA that control metabolic activities and responsible for specific characteristic feature of any organism.

12. What is the meaning of term 'allele' ?
Alleles are the different forms of a gene that controls a trait.
Eg:- Suppose 'Tt' is the factors responsible for the trait, 'height', the allele 'T' determines tallness and the allele 't' determines dwarfness.

13. Offsprings of the same parents may show differences among themselves. Why ?
Fertilization causes change in the allele combination in the chromosomes and it causes slight difference among the offsprings.
(According to Mendel, the difference is due to the <u>independent assortment</u> of each character or trait)

14. Name the 2 types of nucleic acids.
DNA (deoxyribo nucleic acid) and **RNA** (ribo nucleic acid)

15. Who proposed the double helical model of DNA ?
James Watson and Francis Crick (in 1953)

16. Comparison between the two types of nucleic acids, DNA and RNA.

	DNA	**RNA**
Number of strand	2	1
Type of sugar	deoxyribose	ribose
Nitrogen bases	Adenine, **thymine**, cytosine, guanine	Adenine, **uracil**, cytosine, guanine

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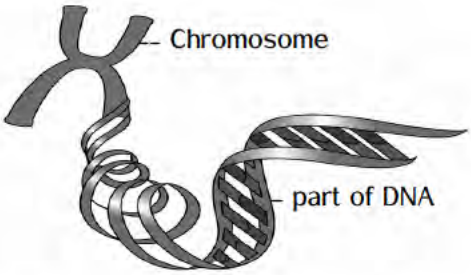
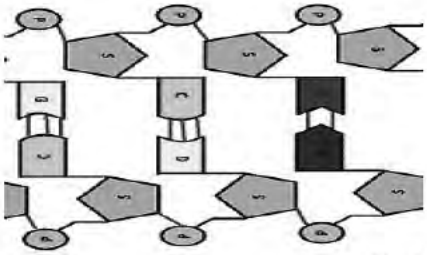


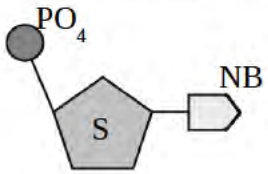
17. Explain the Watson-Crick model of DNA.
Each chromosome contains a DNA , which is made up of several **nucleotides**. DNA is a double helical structured molecule. The two long strands of DNA contain deoxyribose sugar and phosphate groups and its steps are made of pairs of **nitrogen bases**. The nitrogen base, adenine pairs with thymine and the nitrogen base, cytosine pairs with guanine.

In other words, DNA molecule is made up of four kinds of nucleotides, namely adenine nucleotide, thymine nucleotide, cytosine nucleotide and guanine nucleotide.



Nucleotides

18. Define a nucleotide.
Nucleotides are the basic units of nucleic acids, (DNA, RNA).
A nucleotide is made up of a nitrogen base, a sugar molecule and a phosphate group.

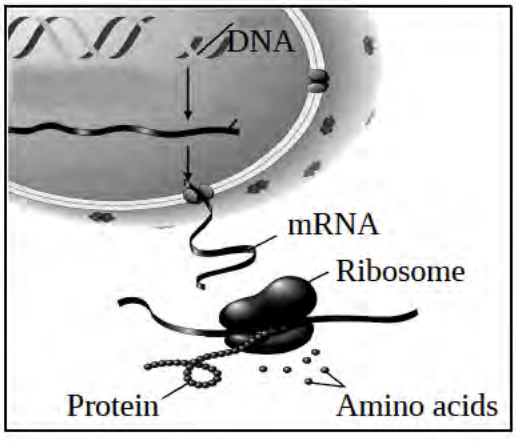


19. Molecules seen in the nucleic acids that contain nitrogen and are alkaline in nature ?
Nitrogen bases.

20. Adenine : Thymine;
Guanine : ---------- ?
Cytosine.

21. How do genes act ?
Genes, which are the specific parts of DNA, act through synthesizing proteins.
Proteins are formed in the ribosomes. Different types of RNA involve in this process.

22. DNA unwinds and ---------- is synthesized which carries the information from DNA to the ribosomes.
mRNA.



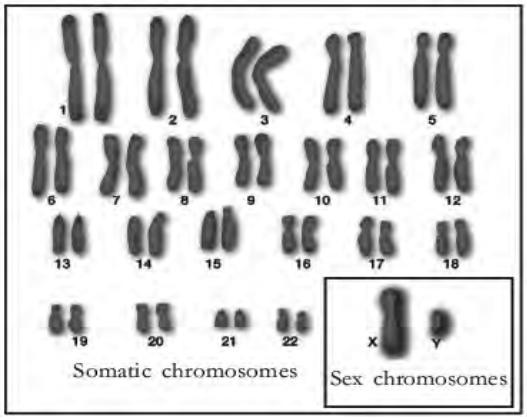
23. The stages of protein synthesis of DNA (The action of genes) ?
- DNA unwinds and mRNA forms.
- mRNA reaches outside the nucleus.
- mRNA reaches ribosomes.
- Based on the information in mRN, amino acids are transferred to ribosomes by tRNA.
- Ribosomes bind amino acids to form protein molecule.

24. Name different types of RNA.
mRNA (messenger RNA), **tRNA** (transfer RNA), **rRNA** (ribosomal RNA).

25. The cell organelles where protein synthesis occur ?
Ribosomes.

26. How many chromosomes are seen in each cell of human being ?
46 (23 pairs) chromosomes.
Out of which, 44 (22 pairs) are **somatic chromosomes** and 2 (one pair) are **sex chromosomes**.

44+XX is female and **44+XY** is male



27. The two types of sex chromosomes ?
X and Y chromosomes.
[XY in males and XX in females]

28. Y chromosome of male gamete : Male child ;
X chromosome of male gamete : ---------- ?
Female child

29. What are the reasons for variations in organisms ?
Crossing over, combination of allele during fertilization and mutation occur in chromosomes.

30. Define the term 'crossing over'. How does crossing over cause variations ?
The process of pairing of chromosome and exchanging their parts, during the initial phase of meiosis, is called **crossing over**. As a result of this, part of one DNA becomes the part of another DNA, causing a difference in the normal distribution of genes. This may causes expression of new characters (variations) in the offsprings.

31.How fertilization causes variation in offsprings ?
When gametes undergo fusion (fertilization), the combination of allele changes. This causes the expression of characteristics in offsprings that are different from parents.

32. Define mutation.
Mutation is a sudden inheritable change in the genetic constitution of an organism. It may occur due to the defects in the duplication of DNA, certain chemicals, radiations etc.
Mutation causes changes in genes, that lead to variations in characters.

33. The protein which gives colour to our skin ?
Melanin.

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34. What may be the reason in the colour difference of skin in people living in various parts of the world ?
Melanin, a pigment protein, imparts colour to the skin . The difference in gene function is the reason for colour differences of skin. The differences in skin colour is mere an adaptation to live under sun.

Youtube video links for this chapter:

Part 1 : https://youtu.be/Tu8Ztn9vQWk
Part 2 : https://youtu.be/qivKb8Oc6Aw
Part 3 : https://youtu.be/yCWoqzsFTo4

7. GENETICS OF THE FUTURE

CONTENT

* Genetic engineering and Biotechnology
  - What ? How ?
  - Genome Project, Genome mapping
* The scope of Genetic engineering
  - Genetically modified organisms for medicine, food etc.
  - .Gene therapy
  - DNA finger printing
* The possibility to misuse genetic engineering.

1. What is biotechnology ?
Biotechnology is the use of microrganisms and biological processes for various human requisites.

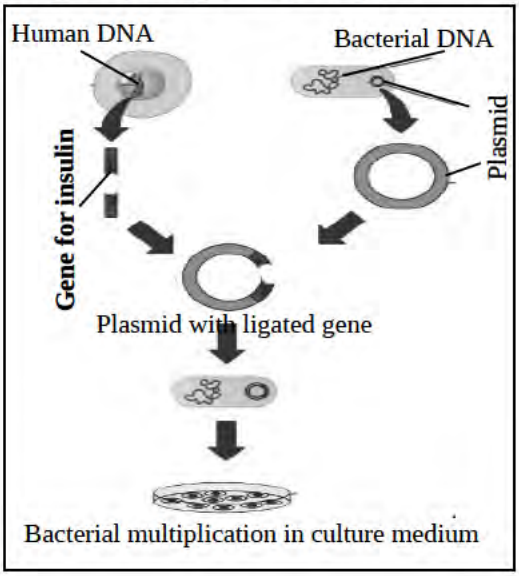
2. What is modern biotechnology ?
Modern biotechnology includes the production of organisms with desirable qualities by changing their genetic material. Genetic engineering is the modern form of biotechnology.

3. What is genetic engineering ?
Genetic engineering is a technology that controls traits of organisms by bringing about desirable changes in their genetic constitution.

4. Methods of biotechnology that man adopted and practised traditionally,
- Yeast (a fungus) was used to prepare food items like bread.
- Bacteria and fungi were utilized to convert sugar in to alcohol to make wine, appam or cake.

5. Give example for modern biotechnological practices.
- Development of human insulin producing bacteria.
- Production of 'pharm animals', that yielding medicines or vaccines
- Production of high yield variety of food crops and animals.

6. How is it possible to bring about desirable changes in an organism ?
Genetic modification in organism is done by cutting or joining specific genes, using certain enzymes. This process is known as genetic engineering.



7. Describe the stages in the production of human insulin bacteria through the process of genetic engineering.

a- From human DNA, cut the gene responsible for the production of insulin.
b- Plasmid (circular DNA) is isolated from a bacterium.
c- Human insulin gene is ligated with the isolated plasmid, which is used as the 'vector'
d- Insert this ligated plasmid in to another bacterial cell.
e- This bacterium is allowed to multiply in a culture medium to produce inactive insulin.
f- Active insulin is produced from this.

8. Define 'vectors' in genetic engineering.
Vectors are other DNA (usually bacterial DNA / plasmid), by which genes can be transferred from one cell to another.

9. What do you mean by genetic scissors and genetic glue that are used in the process of genetic engineering ?

The enzymes like *Restriction endonuclease*, used to cut DNA at specific sites, are generally called as '**genetic scissors**'. The enzymes like *Ligase*, used for joining DNA at specific sites, are generally called as '**genetic glue**'.

10. Genetic scissor : Restriction endonuclease,
Genetic glue : ---------- ?
Ligase

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11. What is gene therapy ? How is it beneficial to mankind ?

Gene therapy is a method of treatment in which the genes that are responsible for diseases are removed and normal functional genes are inserted in their place.

Gene therapy has triggered great hope in the control of genetic diseases.

12. What is ' Human Genome Project'.

The human genome has 2400 functional genes present in the 46 chromosomes.
To find out the exact gene for a specific trait and its location in our genome, a project called **Human Genome Project**, started in 1990 and ended in 2003 in various laboratories of the world.

The Gene mapping is the technology helped us to identify the location of a gene in the DNA.

13. What is gene mapping ?

Gene mapping is a technology by which we can locate a specific gene in the DNA responsible for a particular trait.

14. The sum of genetic material present in an organism is called its --------- ?

Genome

[The human genome includes about 24,000 functional genes present in his 46 chromosomes.
About 200 genes in human genome are identical to those in bacteria.]

15. Define the term 'junk genes'.

Majority of our genes seen in the chromosomes are non functional and is known as '**junk genes**'.

16. What do you mean by pharm animals ?

Genes responsible for the production of human insulin and growth hormones etc. are identified and inserted in animals like cow or pig to transform them in to '**pharm animals**' (animals providing pharmaceuticals or medicines).

Medicines thus produced can be extracted from the blood or milk of such genetically modified animals.

17. Examples for proteins, used as medicines that can be produced from genetically modified animals.

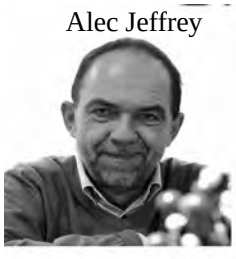
Interferons (for viral disease),
Endorphin (for pain relief),
Somatotropin (for growth disorders),
Insulin (for diabetes mellitus).

18. What is DNA profiling ?

The technology of testing the arrangement of nucleotides in the DNA of persons is called **DNA profiling** or **DNA finger printing** (**DNA testing**).

19. The developer of DNA finger printing ?

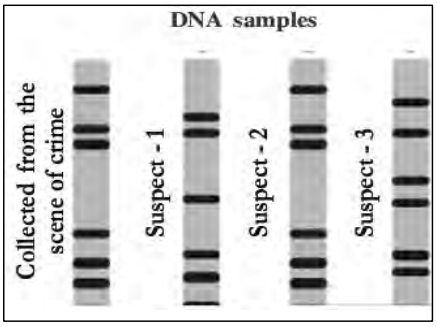
Alec Jeffrey



20. What is the basic principle behind this technology ?

The arrangement of nucleotides in the DNA of each person differs. In DNA profiling, we test the arrangement of nucleotides in the particular person with that of others.

21. Mention the scope of DNA testing.
- To find out hereditary characteristics,
- To identify real parents in the case of parental dispute
- To identify persons found after a long periods of missing due to war or natural calamities.
- To prove murder, robbery etc.



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22. DNA profiling : For identifying person or other organisms,
---------- : For the treatment of genetic diseases (gene therapy)
Gene mapping.

23. Mention how gene technology becomes beneficial ?
- Genetically modified organisms producing medicines, food items and other products.
- High productive and disease resistant varieties
- Remedy of genetic diseases through Gene therapy
- DNA finger printing/profiling to identify real person.

24. Examples for pest resistant verieties ?
B.t. Brinjal, B.t. Soyabean, B.t. Cotton.

25. What are the possibilities to misuse genetic engineering ?
It is criticized that genetically modified varieties are threat to indigenous varieties and may cause health issues to human. There are possibilities to use the genetically modified organisms as 'bioweapons'.

26. What are bioweapons ? Which is the technology behind biowar ?
Bioweapons are genetically modified pathogens that might be applied any country to their enemies. Genetic engineering is the technology behind this kind of biowar.

27. 'Since genetic engineering has many harmful effects, it shouldn't be promoted'. Do you agree with this ?
Genetic engineering or gene technology becomes beneficial to mankind. (see Qns 23, 24). Science and technologies are meant for protection, not for destruction. So, it should be promoted.

28. Make a few logo sentences that can be used for the awareness programme against the misuse of science and technology.
- Genetic modification can be allowed only for the benefit of mankind.
- Avoid all weapons including bioweapons, save life.
- Science and technologies are meant for protection, not for destruction.

YouTube video link of the
focus area covered portion of this chapter : https://youtu.be/M6DZjKdkcg4

8. THE PATHS TRAVERSED BY LIFE

CONTENT

* Origin of first life form on earth
  - Theory of chemical evolution - Urey-Miller experimental support
* Evolution of primitive cell (Geological time scale)
* Theories of evolution
  - Theory of Lamarck
  - Darwin's theory of Natural selection
  - Neo Darwinism – Mutation theory of Hugo deVries
* Evidences of evolution -Fossils, Comparative morphology, Biochemistry-Physiology, Modern molecular biology.
* Stages in the history of human evolution.

1. The hypotheses or theories that are related to the origin of life in earth ?
Theory of Chemical evolution and the Panspermia theory.

2. What is the argument of Panspermia theory ?
The **Panspermia theory** argues that life has originated in some other planet in the universe and accidentally reached the earth.
The organic substances obtained from the meteors that fell on earth, support this hypotheses.

3. What were the ideas proposed by Oparin and Haldane on the origin of life on the earth ?
[Describe the **theory of chemical evolution** on the origin of life]

A.I. Oparin (Russia) and J.B.S Haldane (Britain) proposed the theory of chemical evolution. The theory states that life originated as a result of the changes that occurred in the chemical substances in seawater, under specific conditions in primitive earth.


According to their theory, simple organic molecule are formed first in the primitive ocean by a series of chemical reactions of certain molecules of the primitive atmosphere, where oxygen was absent. By further reactions,complex molecules were formed including genetic material to evolve the first primitive cell, capable of division.

4. Show the process of formation of primitive cell in primitive ocean. (flow chart):

Earth forms,
→formation of primitive gases,
→condensation of water vapour to form rain --- primitive ocean forms,
→ formation of simple organic molecules
→formation of complex organic molecules
→formation of **primitive cell** from nucleic acids and lipids.

5. On the basis of chemical evolution, find out examples for A,B and C category shown below.
A. Gases in the primitive atmosphere B. Simple organic molecules C. Complex organic molecules

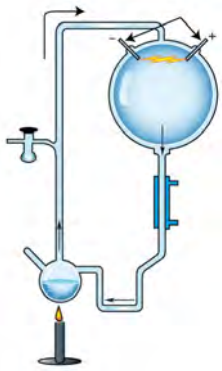
A. methane, ammonia, hydrogen, nitrogen, CO_2, H_2S, water vapour.
B. monosaccharides, amino acids, fatty acids, nitrogen bases.
C. polysaccharides, proteins, nucleotides, lipids...

6. What were the possible sources of energy for chemical evolution in the primitive earth ?
Thunder and lightning, Ultra violet radiations and volcanic eruptions.

7. According to Oparin and Haldane hypotheses, life evolved in---------- as a result of chemical reactions of inorganic molecules, for millions of years, after the origin of earth.
Oceans

8. The scientists who gave support to the theory of chemical evolution ?
Stanley Miller and Harold Urey.

9. Which were the conditions of the primitive earth, recreated by Stanley Miller and Harold Urey ?
Stanley Miller and Harold Urey re-created an experimental set up, in which the glass flask considered as the primitive atmosphere that contained methane, ammonia H_2 and water vapour. Instead of lightning or other energy sources, they passed high voltage electricity through the gaseous mixture. The condensed water from this gaseous mixture was considered as the primitive ocean. Organic molecules like <u>amino acids</u> were found in this.



10. Oparin : Haldane, Stanley Miller : --------- ?
Harold Urey.

11. The organic substances synthesized through Urey-Miller experiment ?
Amino acids.

12. The evolutionary stages after the origin of earth.
Origin of earth ⟶ Chemical evolution begins ⟶ **Primitive cell** (first form of life) ⟶ **Prokaryotes** ⟶ **Eukaryotes** ⟶ **Colony of eukaryotes** ⟶ **Multicellular organisms**.

3800 million years back – origin of life on earth (origin of primitive cell)
3500 million years back – origin of prokaryotes
1500 million years back – origin of eukaryotes
1000 million years back – origin of multicellular organisms

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13. Organisms without definite nucleus : Prokaryotes,
Organism with nucleus and membranous bound cell organelles : ---------- ?
Eukaryotes.

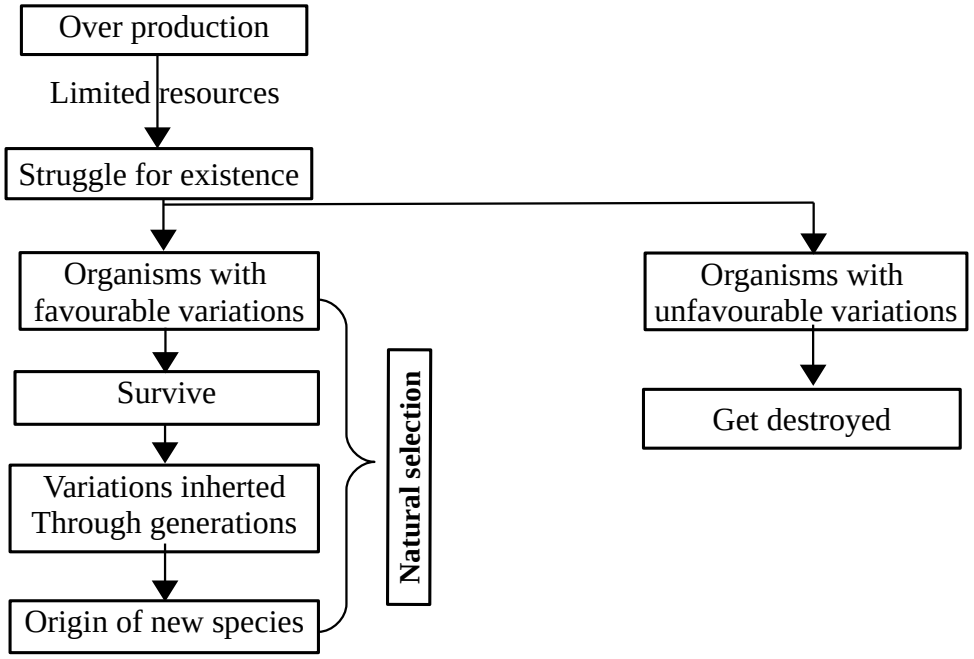
14. The important theories related to organic evolution. Name the proponent of each theory.
* Theory of inheritance of acquired characters by Jean Baptist Lamarck (Lamarckism)
* Theory of natural selection by Charles Robert Darwin (Darwinism)
* Neodarwinism - Theory of mutation by Hugo deVries.

15. The first person who tried to explain organic evolution but did not get acceptance by the scientific world ?
J.B. Lamarck.

16. Explain the ideas of J.B. Lamarck about organic evolution.(Inheritance of Acquired characters.)
<u>The characters developed during the life time of organisms (acquired characters) accumulate through generations and lead to the formation of new species.</u>
According to Lamarck, giraffes had short necks in the beginning. When they faced food scarcity, they stretched their necks to reach out to tall trees. Thus giraffes with long necks emerged through generations .

17. Why did scientists criticize Lamarck's view ?
They did not accept his theory because, the acquired characters are not inheritable.

18. Describe the theory of Natural Selection proposed by Charles Darwin.
<u>Variations develops in each species. Only organisms with favourable variations to that nature, survive and those which are unfavourable get eliminated</u>.
According to Darwin, organisms of one kind, when produced in large numbers (<u>Over Production</u>), compete for food, space, mate, and other limited resources (<u>Struggle for Existence</u>). In this struggle, only organisms with favourable variations survive in that nature. Over a long period, the favourable variations accumulate, resulting the formation of new species.



19. What were the things that influenced Charles Darwin to thought about the importance of nature in the survival or elimination of organisms ?
His studies in Galapagos Islands and the population theory of Robert Malthus.

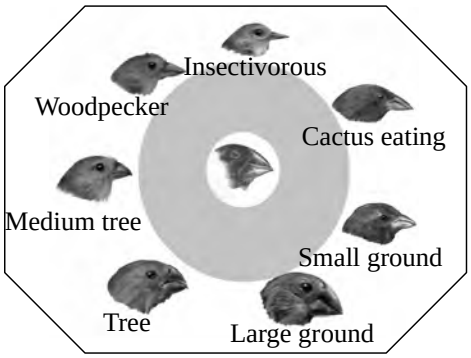
20. The ship by which Charles Darwin reached Galapogos Islands ?
HMS Beagle.

21. Book published by Charles Darwin with his theory, Natural Selection ?
Origin Of Species by means of Natural Selection.

22. Acquired variations : Lamarck, Favourable variations : ---------- ?
Darwin.

23. 'Giraffes with short necks when faced scarcity of food eventually developed in to those with long necks'. How can you described the above view of Lamarck in the light of the view of Darwin ?
When faced scarcity of food, only giraffes with favourable neck (long neck to reach out to tall trees) could survive and others get eliminated.

24. How Darwin could understand that the 13 different finches found in Galapogos Islands came from a common ancestor ?
Though the finches were similar in sound and nesting habits, only they showed differences in food and food habits. [Insectivorous finches have small beaks, cactus feeding finches have long and sharp beaks, woodpecker finches feed on worms in tree trunks have sharp beaks and ground finches feed on seeds have large beaks etc.] So, Darwin thought that they were evolved from a common ancestor.



25. According to Darwin, what might be the reasons for the peculiarities of the beaks of finches ?
The finches of Darwin's had beaks adapted to their feeding habits. When scarcity of food occurred in each island, only beaks with favourable variations (adaptations) to that nature might have survived there.

26. The theory of Robert Malthus was also influenced Charles Darwin to thought about the importance of nature in the survival or elimination of organisms. What was Malthus' theory ?
In his theory of population, Robert Malthus pointed out that rate of food production is not proportionate to the growth rate of human population, and when scarcity of food occur, it will lead to diseases, starvation and struggle for existence.

27. What, according to Darwin, is the cause of the struggle for existence ?
Over Production and hence, limited resources.

28. What was the limitation in Darwin's theory ? Who gave sufficient explanations to this ?
Darwin could not explain the reasons for variations in organisms. However, Hugo deVries explained that one of the reasons for variations in organisms is **mutation** (sudden changes that occur in genes).

29. What do you mean by Neo Darwinism ?
Neo Darwinism is the modified version of Darwin's theory in the light of new information from the branches of genetics, cytology, geology and palaeontology about the reasons of variations occurred in organisms. Hugo deVries first supported Darwin by his theory of mutation.

30. Charles Darwin : Theory of natural selection, Hugo deVries : ---------- ?
Mutation theory.

31.In what ways Hugo de Vries described evolution ?
Hugo de Vries described <u>that sudden and heritable changes (mutation) lead to evolution</u>.

32. The branches of science which provide evidences to organic evolution.
- Palaeontology (fossil study),
- Comparative morphology,
- Biochemistry and Physiology,
- Modern molecular biology.

33. Define fossils.
Fossils are remnants of primitive organisms , preserved in earth crust.
(Fossils may be the body, body parts or imprints of organisms.)

34. What evidences of organic evolution do the study of fossils (Palaeontology) reveal ?
- Primitive fossils have simple structure.
- Recently formed fossils have complex structure.
  (The study of fossils from different layers of rocks indicate that complex structured organisms are evolved from primitive simple organisms.)
- Certain linking fossils reveal the evolution of one form of organisms from another form.

35. 'Comparative study of structure gives evidences to evolution'. Evaluate this statement.
Though there are differences in the external structure (morphology) among different organisms , there are certain similarities in their internal structure (anatomy). The evidences from the comparative morphological studies justify the inferences that all organisms were evolved from a common ancestor.
For example,
The forelimbs in lizard, bat and whale are internally similar (in blood vessels, nerves, muscles and bones) but morphologically different (homologous organs). Reason for these differences are their adaptations to live their own habitats.

Homologous organs

36. What do you mean by **homologous organs** ?
Organs that are similar in structure but perform different functions are called homologous organs.

37. How do biochemistry and physiology justify evolution ?
All organisms are made up of cells with protoplasm. There are similarities among the cell organelles and cellular activities. Enzymes control chemical reactions and energy is stored in ATP molecules in all organisms. Hereditary factors are gene , seen in DNA and the structure of DNA is alike in all. Carbohydrates, proteins and fats are the basic substances. There are similarities in growth, excretion etc.

38. What evolutionary interference can be arrived from the evidences from the comparative morphological , biochemical and physiological studies ?
All organisms were evolved <u>from a common ancestor</u>.

39. What evidences of organic evolution do the study of modern molecular biology provide us ?

a). Through a comparative study of protein molecules in different species, the evolutionary relationship (similarity / difference) among organisms can be identified.
For instance, we can analyse the similarities or differences in the sequence of amino acids in the beta chain of haemoglobin molecules of different mammals and there by we can understand about the evolutionary relationship among them.

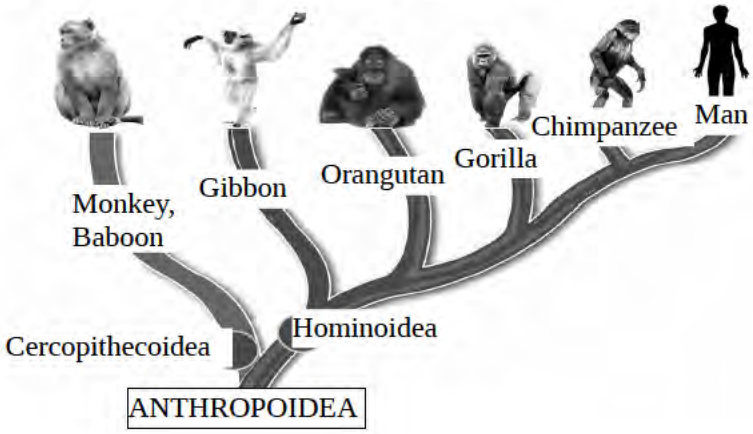
b). Mutations are the main reason for evolutionary changes. Through the molecular studies, we can find out how mutation occur in the genes that determine amino acid sequence in protein molecules. From this we can infer the period of separation of different group of organisms from their ancestor.

40. The differences of the sequential arrangement of amino acids in the beta chain of haemoglobin of man with other animals are given below. Which one is so close to human being ?

Chimpanzee	No difference
Gorilla	Difference of 1 amino acid
Rat	Difference of 31 amino acids

Chimpanzee is so close to human being.

41. Evolutionary tree of certain organisms related to man.



Anthropoidea

Cercopithecoidea	**Hominoidea**
Feature * Small brain * Long tail	Feature * Developed brain * Freely movable hands
Eg:-Monkey, Baboon	**Eg**:- Gibbon, Orangutan, Gorilla, Chimpanzee, Man

42. Find out the missing links in the following evolutionary series of hominoidea.
Gibbon → ------A------ → Gorilla → --------B------ → Man.

A- Orangutan B- Chimpanzee.

43. Do you agree with the statement that man is evolved from monkeys ? What is your opinion ?
This statement is wrong. Man come under the group Hominoidea while monkeys are included in Cercopithecoidea. It is believed that both the ancestors of man and monkeys are evolved from a common ancestor.

44. The oldest fossil of the genus ,Homo ?
Homo habilis

45. How do modern man differ from the other groups of human beings ?
Modern man have developed brain and equipped with advanced technologies.

46. Table showing the organisms that are included in the evolutionary history of modern man.

A (Human beings)	B (Features)	C. (First fossil discovered from)	Development of brain ⟶
a. Ardipithecus ramidus	Most primitive human race	Africa	
b. Australopithecus afarensis	Slender body.	Africa	
c. Homo habilis	Made weapons from stones and bones	Africa	
d. Homo erectus	Thick chin and large teeth, ability to stand erect	Africa and Asia	
e. Homo neanderthalensis	Contemporary to modern man	Europe and Asia	
f. Homo sapiens	Modern man	First fossils from France	

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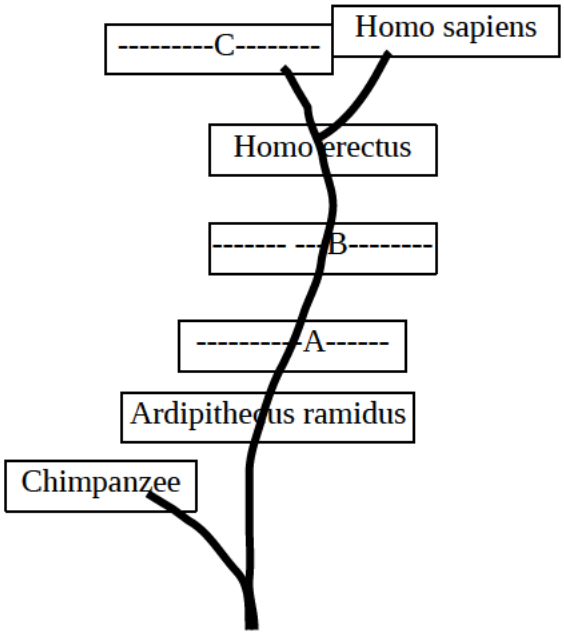
47. Here is an incomplete illustration of human evolutionary tree. Find out the missing links.



A- Australopithecus afarensis.
B- Homo habilis.
C- Homo neanderthalensis.

48. Do the interventions of modern man cause any change to natural evolutionary process ? How ?
Yes. Biodiversity is on a dangerous decline due to the interference of human beings in nature and natural resources. By human interventions climatic changes brought in as well as the extinction of many organisms.(there occurred five mass extinctions in the world history till now)
Human life is possible on earth only with the preservation of other diverse ecosystems.

Youtube video link of Focus area covered portion of this unit : https://youtu.be/p_ND6dAsi8Y

Vist: *odakkal blog*