

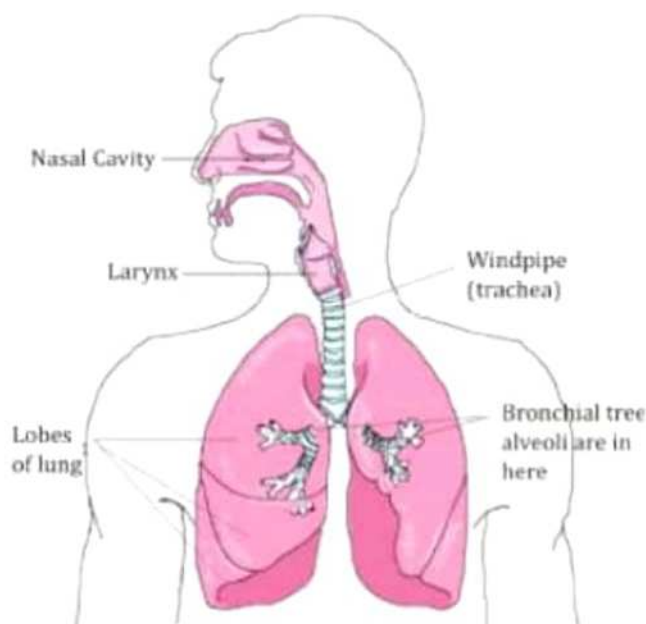
- In lower plants, exchange of gases takes place through general body surface.

### Respiration in Animals

- Animals have specific organs for respiration like **skin, lungs, gills**.
- There should be large surface area, thin wall for efficient diffusion, rich supply of blood capillaries.
- Emphysema, asthma, pneumonia, bronchitis are the respiratory disorders

### HUMAN RESPIRATORY SYSTEM

- Human respiratory system consists of external nostrils, nasal cavity, nasopharynx, larynx, trachea, bronchiole and lungs.
- Overall passage of air in humans is as follows:  
Nostrils → Pharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli → Cells → Blood.



#### (i) Constitution of air in breathing

	Nitrogen	Oxygen	Carbon dioxide
Air inhaled	79%	21%	0.03%
Air exhaled	79%	17%	4%

#### (ii) Respiratory Organs of Some Animals

	<b>Respiratory</b>	<b>Animal</b>
1.	Lungs	Reptiles like lizards, mammals like man, camel, cattle, etc.
2.	Skin	Frog, earthworm and leeches
3.	Gills	Fishes, tadpoles and prawns
4.	Trachea	Insects, centipedes and millipedes.
5.	Book lungs	Spider, scorpion, ticks and mites.
6.	Book gills	King crab, prawn, cray fish and Daphnia
7.	Air bladder	Lung fish and bony fishes (e.g., Lebeo)
8.	Air sacs/lungs	Birds
9.	Body surface	Amoeba, Euglena, Chlamydomonas, Spirogyra, Hydra, etc.

## (ii) Difference between aerobic and anaerobic respiration

<b>Aerobic respiration</b>	<b>Anaerobic respiration</b>
Takes place in the presence of oxygen	Takes place in the absence of oxygen
End products are carbon dioxide, water and energy	End products are carbon dioxide and ethyl alcohol in plants and lactic acid and energy in animals
Eg- Most plants and animals	Eg ? Yeast

## Transport of Gases

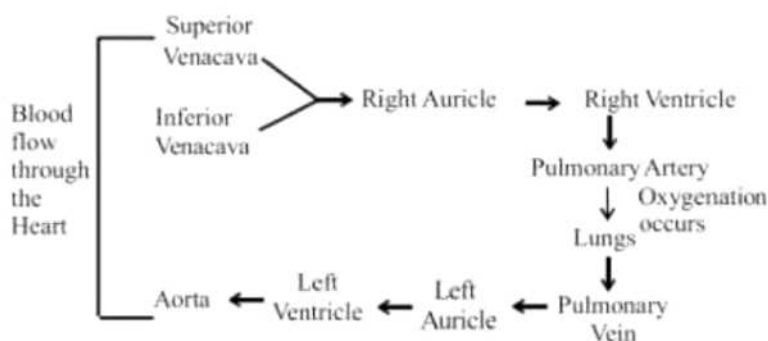
- 97% of oxygen is transported from the lungs to the tissues in combination with haemoglobin ( $\text{Hb} + \text{O}_2 \longrightarrow \text{HbO}_2$ , oxyhaemoglobin). 3% is transported in dissolved condition by the plasma.

### There are three ways of transport of $\text{CO}_2$

- 95%–7% (approximately) of  $\text{CO}_2$  is transported, being dissolved in the plasma of blood.
- $\text{CO}_2$  reacts with the water to form carbonic acid ( $\text{H}_2\text{CO}_3$ ) by the enzyme carbonic anhydrase (present in RBC).
- $\text{CO}_2$  reacts with amine radicals ( $\text{NH}_2$ ) of haemoglobin molecule and forms a carbamino-haemoglobin ( $\text{HbCO}_2$ ) molecule. Nearly 23% of  $\text{CO}_2$  is transported through this mode.

## TRANSPORTATION / CIRCULATION IN HUMAN BEINGS

- **Transportation** is a process in which substances are absorbed in one part and move to the other parts of the body.
- Transportation in human beings is done through heart by pumping and receiving blood.
- **Erythrocytes, Leucocytes, blood platelets** are the three types of blood-cells.
- RBCs are circular shaped without nucleus.
- WBCs do not have Hb, they are large nucleated cells and provide immunity to the human body.
- **Blood platelets** are rounded, colourless, biconvex, non-nucleated which help in coagulation of blood.
- **Blood clotting** is a protective function and helps to prevent its own loss from the body.
- **Karl Landsteiner** discovered blood groups A, B and AB.
- Arteries are thick-walled and transport blood from heart to the various parts of the body.
- Veins are thin walled and carry blood from various organs to the heart.
- Capillaries are narrow and thin walled.
- **Heart** is situated in the thoracic cavity between two lungs. Heart is made up of cardiac muscles which works continuously. Human heart has four chambers *i.e.* two auricles and two ventricles.

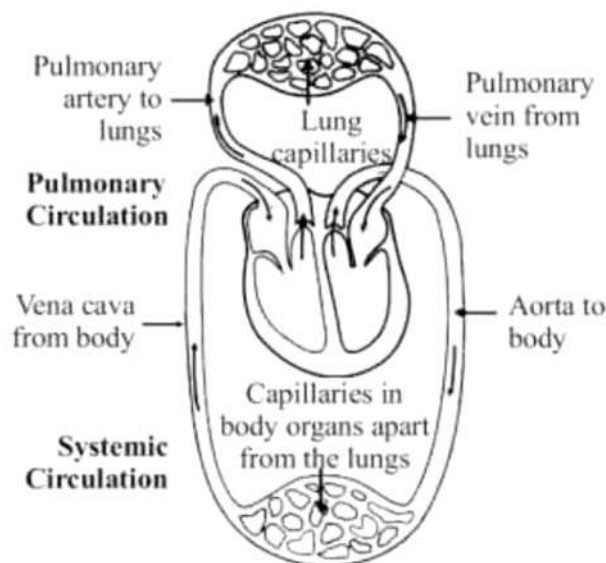


- Normal heart rate is 72/minute.
- On contraction – Systolic phase – 120 mm of Hg
- On Relaxation – Diastolic phase – 80 mm of Hg.

### Double Circulation in Man

The circulatory system of man is called double circulation as the blood passes through the heart twice in one complete cycle of the body. **It involves two circulations:**

- (i) **Pulmonary Circulation:** This circulation is maintained by the right side of the heart. It begins in the right ventricle which expels the blood into the pulmonary trunk. The blood flowing into the vascular system of the lungs, becomes oxygenated and returns to the heart (left atrium) through pulmonary veins.
- (ii) **Systemic Circulation:** This circulation is maintained by the left ventricle which sends the blood into the aorta. The aorta divides into arteries, arterioles and finally to capillaries and thereby supplies oxygenated blood to various parts of the body. From there deoxygenated blood is collected by venules which join to form veins and finally vena cava and pour blood back into the heart.



**Fig : Double circulation in Man.**

## CIRCULATORY PATHWAYS

The circulatory patterns are of two types –

**Open circulatory system** is present in arthropods and molluscs in which blood pumped by the heart passes through large vessels into open spaces or body cavities called sinuses.

## Closed circulatory system

- Annelids and chordates have a closed circulatory system in which the blood pumped by the heart is always circulated through a closed network of blood vessels. All vertebrates possess a muscular chambered heart.
- **Fishes** have a **2-chambered** heart with an atrium and a ventricle.
- **Amphibians** and the **reptiles** (except crocodiles) have a 3-chambered heart with two atria and a single ventricle. **Crocodiles, birds** and **mammals** possess a **4-chambered heart** with two artia and two ventricles.
- To pump out blood, the heart chamber undergoes alternate contraction called **systole** and relaxation called **diastole**. The sequence of systole and diastole causes the heart sound **Lub** and **Dub**.
- Arteries transport **pure blood** from the heart while veins carry **impure blood** to the heart.
- Human heart beat is myogenic in nature, i.e., initiated by a patch of modified heart muscles itself without requiring an external stimulation. This patch is called **SA node** (sino-auricular node) or **pacemaker**.
- When SA-node becomes abnormal, i.e., it does not generate cardiac impulses, it can be cured by surgical grafting of an artificial pacemaker (an electric device) in the chest of the patient. It stimulate the heart electrically at regular intervals.

## Heart Beat and Pulse

The human heart beats at the rate of about 72-80 per minute in the resting condition.

## Electrocardiograph

ECG is the graphic record of electronic current produced by the excitation of cardiac muscles.

## BLOOD VESSELS

Blood vessels are of three types:

## Arteries

These are thick walled blood vessels which carry the blood away from the heart to various body parts. These are deep seated in the body and have no valves in them.

These carry oxygenated blood except the pulmonary artery which carries deoxygenated blood to the lungs. In arteries, blood flows at a high pressure and a higher speed.

## Veins

These are thin walled blood vessels and carry blood away from various body parts towards the heart. These have valves in them to prevent back flow of blood in them. Blood flows at low pressure and at a lower speed.

These carry deoxygenated blood except the pulmonary vein which carries oxygenated blood to the heart.

## Capillaries

These are the thinnest blood vessels and connect arteries to the veins.

These help in exchange of materials like the nutrients, gases, waste product, etc., between blood and cells.

## HUMAN BLOOD GROUPS

The system of blood groups in humans was discovered by Karl Landsteiner in the 1900s.

There are four phenotypes of blood namely **A**, **B**, **AB** and **O** produced by three different alleles **I<sup>A</sup>**, **I<sup>B</sup>** and **i** of a gene.

The allele **I<sup>A</sup>** and **I<sup>B</sup>** are equally dominant and do not interfere with expression of each other hence the allele **I<sup>A</sup> I<sup>B</sup>** are said to be co-dominant because both are expressed in the phenotype **AB**.



Blood Group	Antigen present in RBC	Antibody present in plasma	Possibility of blood donation
A	A	b	Can donate blood to A and AB
B	B	a	Can donate blood to B and AB
AB	A, B	none	Can receive from all but donate to only AB
O	None	a, b	Can donate to all but receive blood only from O

## Blood

- Blood is a fluid connective tissue and composed of blood corpuscles, and plasma.
- It is slightly alkaline in nature (pH 7.4).
- Its average volume in an adult is 5–6 L.
- **Plasma** : 60% of blood is plasma.
- **Plasma composition**: 90% water, 7% protein, 0.9% salt and 0.1% glucose.
- **Serum** : The clear liquid left after the extraction of fibrinogen and protein from plasma.
- During blood clotting fibrinogen changes into fibrin by thrombin which is obtained from thromboplastin in the presence of  $\text{Ca}^{2+}$ .
- Blood helps in transport of oxygen, nutrient, disease control, maintain body temperature

## Blood Type of Parent and their Children

Blood Type of Parent (Homo or Heterozygous)	Possible Blood Type of Children
O × O	O
O × A	O, A
O × B	O, B
O × AB	A, B
A × A	A, O
A × B	O, A, B, AB
A × AB	A, B, AB
B × B	B, O

## **BLOOD CELLS**

### **Erythrocytes (RBCs)**

- Red blood cells contain the blood's haemoglobin and distribute oxygen.
- Mature red blood cells lack a nucleus and organelles in mammals. However, in **camel** and **Llama** it is nucleated.
- One RBC contains about 280 million of haemoglobin molecules.
- RBC is formed in bone marrow.
- Average life span : 20–120 days
- Destruction of RBC takes place in liver and spleen.
- Haemoglobin contains iron containing compound, giving red colour to blood.

### **Leukocytes (WBCs)**

- These are part of the body's immune system; they destroy and remove old or aberrant cells and cellular debris, as well as attack infectious agents and foreign substances. These are much less in number than RBCs (1 : 600).
- WBC are formed in bone marrow, lymph node and sometimes liver, spleen.
- Avg. life span : 5-21 days

### **Thrombocytes (Platelets)**

- It is responsible for blood clotting (coagulation). It changes fibrinogen into fibrin.
- It is found only in the blood of human and other mammals.
- There is no nucleus in it
- Its formation takes place in bone marrow.
- It is destroyed in spleen
- In dangué fever, number of platelets is reduced.

### **Comparison between Plasma and Lymph**



Plasma	Lymph
It contains 92% water, 8% blood plasma proteins and trace amounts of other materials	Lymph contains a variety of substances including proteins, salts, glucose, fats, water and WBCs.
It is cell free part of blood, contain salts, considerable amount of proteins as well as more or less all constituents of body.	It is modified tissue fluid, contains cells like lymphocyte and monocytes, salt and small amount of proteins. It is colourless.
It flows within blood vessels.	It flows within lymphatic vessels.
It takes part in nutrition, excretion, respiration, etc. by transporting various materials and helps in the defence mechanism of the body by producing antibodies.	It supplies nutrition to tissue devoid of blood supply, takes part in fat absorption and defence mechanism of the body.
It can coagulate because it contains fibrinogen and prothrombin	It can coagulate but very slowly because it contains these two in small quantities.

### Blood Pressure (BP)

- The pressure created by the blood on the walls of the blood vessels due to the repeated pumping of heart is called **blood pressure**. It is measured by **sphygmomanometer**.
- It can be felt at certain places in our body, viz wrist of the hands etc.
- Blood pressure is recorded as **systolic/diastolic**. Blood pressure in a normal person is 120/80 mm Hg. Factors affecting blood pressure are age, cardiac output, total peripheral resistance, etc.
- If a person has persistent high blood pressure then it is called **hypertension** and persistent high blood pressure is 150/90 mm Hg. Factor responsible are overeating, fear, worry, anxiety, sorrow, etc. **Hypotension** is condition of low blood pressure, i.e. persistent 100/50 mm Hg.
- **Electrocardiograph (ECG)** is used to check proper working of heart by using electrodes.

### TRANSPORTATION IN PLANTS

- The movement of molecules from lower concentration to higher concentration is known as **osmosis**.
- Vascular system helps the plants for transportation of water and minerals.
- **Xylem** and **Phloem** are conducting tissues of plants.

- Tracheids are long, thin, spindle shaped cells and have thick cell walls.
- The loss of water in the form of vapours from the leaf to the atmosphere is called as **transpiration**.
- Transpiration helps in the upward movement of sap or water from the root to leaves.
- Transport of food from leaves to other parts of the plant is called translocation, which is carried out by phloem.

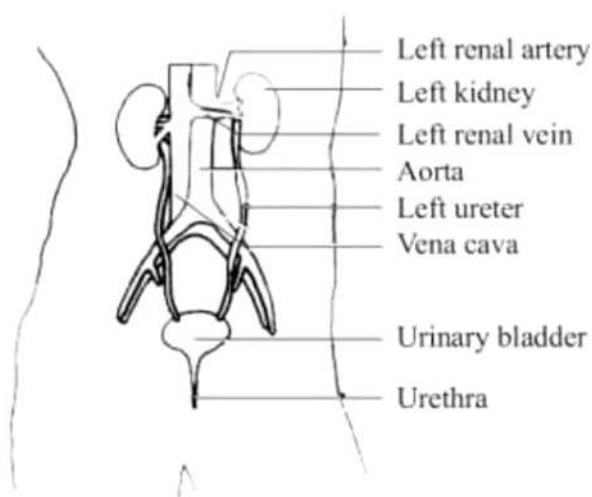
## EXCRETION IN ANIMALS

- The removal of unwanted waste materials from the body is called **excretion**.

Contractile vacuole helps in the excretion in single celled organisms.

## EXCRETION IN HUMAN BEINGS

- Excretory system of human beings consists of a pair of **kidneys**, a pair of **ureters**, **urinary bladder**, **urethra**.



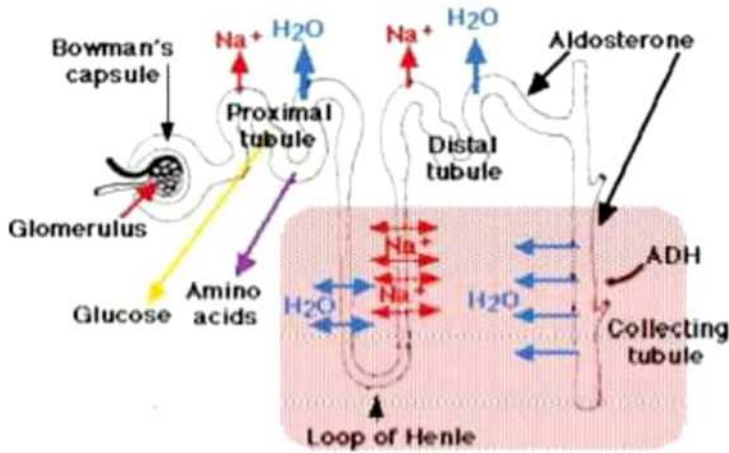
**Fig : Excretory system in human beings**

## KIDNEY

- It is bean-shaped, chocolate brown organ lying in the abdomen, one on each side of the vertebral column just below the diaphragm.
- These form the urine and controls osmotic pressure within the organism with respect to external environment.

Nephrons are the functional and structural unit of kidney. Each nephron is made up of Bowman's capsule and renal tubule.

### Urine Formation



### Kidney Functions:

1. Formation of urine
  2. Purification of blood plasma
  3. Excretion of harmful substances such as urea, uric acid and creatinine.
  4. Regulation of blood pressure through hormones
- The process of excreting ammonia is -**Ammonotelism**. Kidney plays a minor role in the elimination of ammonia e.g. teleost fishes, tadpoles, aquatic soft bodied invertebrates. Organism undergoing ammonotelism are called **ammonotelic**.
  - The process of excreting urea is - **Ureotelism**. e.g.s. are mammals, many terrestrial adult amphibians and cartilaginous fishes (shark).
  - The process of elimination of uric acid is **Uricotelism**, e.g.s. are land snails, insects, birds and many reptiles.
  - Each kidney has nearly one million complex tubular structures called **nephrons**, which are the functional units of kidney. These filter the blood to produce urine.

### Excretory Organs of Some Animals

Excretory Organ	Animal
Contractile vacuole	Amoeba
Flame cells/solenocytes	Tapeworm
Renette cell	Ascaris
Nephridia	Earthworm
Malpighian tubules	Cockroach
Coxal glands	Scorpion
Green glands	Prawn

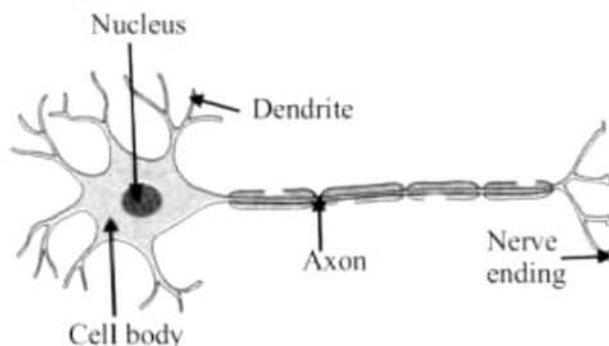
- Kidneys also help to maintain osmotic potential in blood & tissue fluid.
- Improper functioning of the kidneys may lead to accumulation of water in the body called **Oedema, Nephritis, Kidney Stones, Gout**.
- An artificial kidney is a device to remove nitrogenous waste products from the blood through **dialysis**.

## EXCRETION IN PLANTS

- Oxygen is waste product of photosynthesis in plants.
- Many waste products are stored as resins and gums in plants.
- **Co-ordination in Animals :**

## NERVOUS SYSTEM

- It comprises neurons, nerves, nervous organs which control the activities of different organs of the body.



**Fig. Structure of neuron**

- **Neuron** is the structural and functional unit of nervous system.

### Neuron (or nerve cell) has three components

- (i) **Cell body** is a rounded, stellate part of neuron that contains a central nucleus, abundant cytoplasm and various cell organelles except

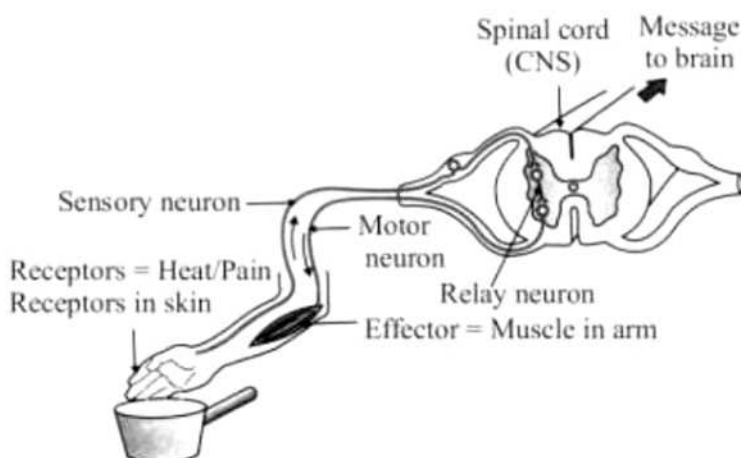
centrioles. It maintains the neuron through its metabolic activity and growth.

- (ii) **Axon** has an insulating and protective sheath of myelin around it. Myelin is made up of fat and protein.
- (iii) **Dendrites** are fine, short and branched protoplasmic processes of cell body that pick up sensations (physical, mechanical, electrical, chemical) and transmit the same to the cell body.
- The neurons transmit the messages to the nervous system in the form of electrical signals. They pass the impulse to the cell body and then along the axon. The axon passes the impulse to another neuron through a function called **synapse**.

### There are three types of neurons

- (i) **Sensory Neuron** : It transmits impulses from sensory cells (or receptor) towards the central nervous system.
- (ii) **Motor Neuron** : It transmits impulses from the central nervous system towards the muscle cells (or effectors).
- (iii) **Relay Neuron** : It occurs in the central nervous system where they serve as links between other neurons.

### Reflex Action



**Fig. Reflex Arc**

- **Reflex Action** : It is rapid, automatic, definite response to stimulus by an organ without involving brain for its initiation. The pathway which is followed by this is called **reflex arc**.



Stimulus —————> Receptor Organ  
 —————> Sensory Neuron

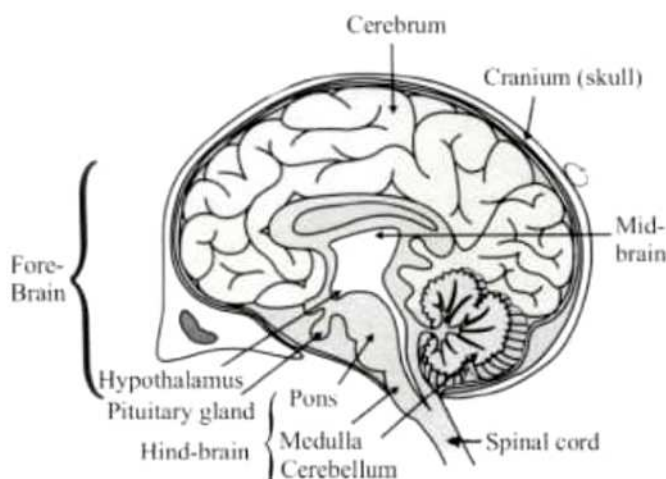
Effector organ <———— Motor Neurons  
 <———— Spinal Cord

E.g. Knee-jerk reflex, sneezing, yawning, blinking of eye.

**There are two types of reflexes :**

- (i) **Simple or unconditioned reflexes** – These reflexes are regulated through spinal cord (CNS) and participation of brain is not necessary.
- (ii) **Conditional Reflexes** : In these reflexes, the participation of brain is essential.

## Human Brain



**Fig. Human brain**

- Nervous system of man consists of three parts –
  - (i) **Central Nervous System**, which includes **brain and spinal cord**.
  - (ii) **Peripheral Nervous System**, comprises of nerves arising from brain and spinal cord.
  - (iii) **Autonomic Nervous System**.
- Olfactory lobes are concerned with sense of smell.
- Brain is inside the cavity called **cranium**, weighs about 1325 gm. It is covered by thin, non-nervous layer (piameter). It is filled with **cerebrospinal fluid**. It is divided into three parts –
  - (a) Forebrain : (i) Olfactory lobes (ii) Cerebrum



(b) Midbrain

(c) Hind brain : (i) Cerebellum (ii) Medulla oblongata (iii) Pons

- **Fore brain** (Cerebrum) is the main thinking part of the brain. All our thoughts, sensations, actions and movements are controlled by the cerebrum.
- **Midbrain** consist of nerve cells, connects fore-brain to the hind brain. It has reflex centres for eye movement and hearing response.
- **Hind brain** (Cerebellum) is the second largest part of brain. The surface is of grey matter, deeper part is of white matter. Cerebellum maintains posture, regulates muscle tone.
- **Medulla oblongata** controls involuntary movement, acts as reflex centre for vomiting, coughing, sneezing, swallowing etc.

## CO-ORDINATION IN PLANTS

- The plants coordinate their behaviour against environmental changes by using hormones.
- Plants also use electro-chemical means to convey the information from cell to cell, but unlike in animals, there is no specialised tissue in plants for conduction of information.
- Instead of the specialised proteins found in animal muscle cells, plant cells change shape by changing the amount of water in them resulting in swelling or shrinking and therefore in changing shapes.
- The plant movements made in response to external stimuli fall into two main categories :

### Tropisms (Tropic Movements)

- A growth movement of a plant part in response to an external stimulus in which the direction of stimulus determines the direction of response is called tropism.
- **Types of Tropism :**

- (i) *Phototropism* – movement in response to light.
- (ii) *Geotropism* – movement in response to gravity.
- (iii) *Thigmotropism* – movement in response to touch.

### **Nastic (Nastic Movements)**

- It is not a directional movement of the plant part with respect to the stimulus.

#### **Thigmonasty**

- It is the non-directional movement of a plant part in response to the touch of an object. E.g.- *Mimosa pudica* (Chui-mui).
- The folding up of the leaves of a sensitive plant on touching is due to the sudden loss of water from 'Pulvini' to droop and fall.

#### **Photonasty**

The non-directional movement of a plant part (usually petals of flowers) in response to light is called photonasty.

### **Growth Hormones**

Are the natural growth substances which are produced in any part of the plant.

- (i) **Auxins** : It stimulates growth, phototropism, geotropism 2, 4 - D is used to avoid pre-harvest fruit in oranges, apples, used as weedicide.
- (ii) **Gibberellins** : These can increase the height of plant, can induce parthenocarpy, stimulate flowering.
- (iii) **Cytokinins** : Promote cell division, inhibit or delay ageing, organ formation.
- (iv) **Ethylene** : It's a gaseous plant hormone, used in artificial ripening of fruits, promote ageing in plants, breaks dormancy of several organs.

- (v) **Abscisic Acid (AB A)** : Also known as stress hormone. It is a growth inhibitor, inhibit the process of flowering, seed development.

## HORMONES IN ANIMALS

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- Hormones are the substances which help in control and coordination of the body activities.

### Exocrine Glands

**Mammary, salivary, sweat glands.**

### Endocrine Glands

**Pituitary, thyroid, adrenal glands.**

- (1) **Hypothalamus** : The hypothalamic hormones are also called releasing hormones : TSH, ACTH, FSH, LH.
- (2) **Pituitary gland** : It has two lobes **anterior (adenohypo-physis)** and **posterior (neurohypophysis)**.
  - i. **Anterior lobe** : Secretes TSH (Thyroid Stimulating hormone), ACTH (Adrenocorticotrophic hormone), GH (Growth hormone), FSH (Follicle stimulating hormone), LH (Luteinizing hormone), Prolactin.
  - ii. **Intermediate lobe** : It is responsible for production of melanin pigment.
  - iii. **Posterior lobe** : Secretes oxytocin, vasopressin produced in the hypothalamus and stored in posterior lobe.
- (a) **Oxytocin** : Released during child birth, during breast feeding.
- (b) **Vasopressin** : It's an antidiuretic hormone which controls the secretion of urine by kidney.
- (3) **Pineal** : It lies in the brain. It secretes biogenic amine hormone called **melatonin**. It inhibits ovarian growth and ovulation.
- (4) **Thyroid** : Largest endocrine gland. It produces three hormones **thyroxine, tri-**

**iodothyroxine, calcitonin.** Thyroxine promotes the growth of body tissues. Calcitonin lowers blood calcium level. Its disorder causes goiter.

(5) **Parathyroid** : It increases blood calcium level from bone to blood. Its disorder causes tetany & osteoporoses

(6) **Adrenal**: Produces three hormones –

i. **Glucocorticoids** : Increase blood glucose level, reduces inflammation caused by allergies. Regulated by ACTH.

ii. **Mineral corticoids** : Controls sodium and potassium ratio.

iii. **Sex corticoids** : These stimulate secondary sex characters in males such as voice, body hairs.

(7) **Pancreas** : It is exocrine as well as endocrine. The endocrine part is called islets of Langerhans. It consists of  $\alpha$  and  $\beta$  cells.  $\beta$  cells secrete hormone insulin which regulates blood sugar level. Excess of glucose starts appearing in urine and the disease is called **diabetes**.  $\alpha$ -cells produce hormone **glucagon** which regulates the amount of glucose by converting glycogen into glucose.

(8) **Testes** : It secretes hormone **testosterone** which is responsible for secondary sex characters such as hoarseness in voice, growth of moustaches, beard etc.

(9) **Ovary** : These produces hormones **estrogen, progesterone, relaxin**. Estrogen stimulate secondary sexual characters in females such as development of breast, growth of uterus, vagina and onset of menstrual cycle. Progesterone fixes foetus to the uterus, forms placenta. Relaxin hormone is produced at the time of child birth. It softens pelvic ligament which helps in easy delivery.

**Exercise**

**DIRECTIONS** : This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which only one is correct.

1. Molecular movements are needed for life
  - (a) for repairing and maintaining structures
  - (b) for nutrition
  - (c) for respiration
  - (d) for repairing only
2. Enzymes are
  - (a) vitamins
  - (b) proteins
  - (c) carbohydrates
  - (d) fats
3. In which of the following animals, respiration occurs without any respiratory organ?
  - (a) Fish
  - (b) Frog
  - (c) Cockroach
  - (d) Earthworm
4. The exchange of gases ( $O_2$  and  $CO_2$ ) in a mammal takes place in
  - (a) trachea
  - (b) bronchi
  - (c) bronchiole
  - (d) alveoli
5. The exchange of gases in the alveoli of the lungs takes place by
  - (a) osmosis
  - (b) simple diffusion
  - (c) passive transport
  - (d) active transport
6. The first step in photosynthesis is
  - (a) conversion of light energy to chemical energy
  - (b) reduction of carbondioxide
  - (c) absorption of light energy by chlorophyll

- (d) formation of carbohydrates
- 7. The enzyme present in saliva is
  - (a) amylase
  - (b) lactase
  - (c) pepsin
  - (d) renin
- 8. In anaerobic respiration
  - (a) oxygen is taken in.
  - (b) carbon dioxide is taken in.
  - (c) oxygen is given out.
  - (d) carbon dioxide is given out.
- 9. The blood returning to the heart from lungs via pulmonary vein has more
  - (a) RBC per ml of blood.
  - (b) haemoglobin per ml of blood.
  - (c) oxygen per ml of blood .
  - (d) nutrient per ml of blood.
- 10. The first heart sound is
  - (a) 'Lubb' sound at the end of systole.
  - (b) 'Dub' sound at the end of systole.
  - (c) 'Lubb' sound at the beginning of systole.
  - (d) 'Dub' sound at the beginning of systole.
- 11. The acid present in the stomach is
  - (a) sulphuric acid
  - (b) nitric acid
  - (c) hydrochloric acid
  - (d) sulphurous acid
- 12. Breakdown of pyruvate using oxygen takes place in
  - (a) Golgi bodies
  - (b) chloroplast
  - (c) mitochondria
  - (d) nucleus
- 13. Nature of valves in the heart is
  - (a) membranous
  - (b) muscular
  - (c) tendinous
  - (d) ligamentous



14. Heart beat can be initiated by
  - (a) sinu-auricular node
  - (b) atrio-ventricular node
  - (c) sodium ion
  - (d) purkinje's fibres
15. Oxygenated blood is carried by
  - (a) pulmonary vein
  - (b) pulmonary artery
  - (c) renal vein
  - (d) hepatic portal vein
16. The longest part of the alimentary canal is
  - (a) small intestine
  - (b) large intestine
  - (c) stomach
  - (d) gall bladder
17. Blood from the heart enters the lungs from the
  - (a) right auricle
  - (b) right ventricle
  - (c) left auricle
  - (d) left ventricle
18. Largest heart is found in
  - (a) elephant
  - (b) giraffe
  - (c) crocodile
  - (d) lion
19. Heart beat originates from
  - (a) pacemaker
  - (b) cardiac muscles
  - (c) left atrium
  - (d) right ventricle
20. Which part of a nerve cell contains a nucleus ?
  - (a) Axon
  - (b) Dendrite
  - (c) Cyton
  - (d) Nerve endings

21. All informations from the environment is detected by
  - (a) receptors
  - (b) axon
  - (c) nucleus
  - (d) cell body
22. The respiratory pigment in the blood is
  - (a) haemocyanin
  - (b) haemoerythrin
  - (c) haemoglobin
  - (d) fucoxanthin
23. Reflex arc is formed by
  - (a) muscle → brain → receptor
  - (b) muscle → spinal cord → receptor
  - (c) receptor → brain → muscle
  - (d) receptor → spinal cord → muscle
24. Which of the following tissues provide control and coordination in animals ?
  - (a) Nervous and Skeletal
  - (b) Muscular and Skeletal
  - (c) Muscular and Transport
  - (d) Nervous and Muscular
25. How many pairs of cranial nerves are present in man ?
  - (a) 12
  - (b) 21
  - (c) 31
  - (d) 41
26. The instrument used to measure the blood pressure is
  - (a) barometer
  - (b) sphygmomanometer
  - (c) anaeroid barometer
  - (d) haemocytometer
27. The process that helps in translocation of water and mineral salts

- (a) transpiration
  - (b) photosynthesis
  - (c) dark reaction
  - (d) glycolysis
28. Co-ordination is achieved through nervous system as well as circulatory system by respective agents like
- (a) neurotransmitters and proteins
  - (b) neurotransmitters and hormones
  - (c) neurotransmitters and sugars
  - (d) sugars and hormones
29. The main effect of cytokinin in plants is to
- (a) improve the quality of fruits
  - (b) prevent the growth of lateral buds
  - (c) regulate opening and closing of stomata
  - (d) stimulate cell division
30. Growth of pollen tube towards ovule is called
- (a) phototropism
  - (b) geotropism
  - (c) hydrotropism
  - (d) chemotropism
31. The unit of the filtration system is
- (a) neuron
  - (b) glomerulus
  - (c) nephron
  - (d) bowmans capsule
32. In the event of kidney failure the process used to remove nitrogenous wastes is
- (a) dialysis
  - (b) osmosis
  - (c) diffusion
  - (d) plasmolysis
33. Plants bend towards a light source as a result of
- (a) inability to synthesise chemical regulators.
  - (b) increased amount of food synthesised by leaves.
  - (c) necessity of light for transpiration.

- (d) unequal auxin distribution in their stems.
34. Which statement is incorrect about auxins ?
- (a) They promote the growth of root.
  - (b) They promote the growth of shoot.
  - (c) They influence the formation of flower and ripening of fruit.
  - (d) They inhibit the growth of root.
35. Which hormone regulates the ionic balance in the body ?
- (a) Glucagon
  - (b) Thyroxine
  - (c) Testosterone
  - (d) Vasopressin
36. The waste materials in plants are stored in the form of
- (a) water
  - (b) gums and resins
  - (c) minerals
  - (d) sugar
37. Control and Co-ordination is provided by
- (a) muscular System
  - (b) excretory System
  - (c) nervous System
  - (d) reproductive System
38. Which is the correct sequence of parts in human alimentary canal?
- (a) Mouth → stomach → small intestine → oesophagus → large intestine.
  - (b) Mouth → oesophagus → stomach → large intestine → small intestine.
  - (c) Mouth → stomach → oesophagus → small intestine → large intestine.
  - (d) Mouth → oesophagus → stomach → small intestine → large intestine.
39. The correct sequence of anaerobic reactions in yeast is :

- (a) Glucose  $\xrightarrow{\text{cytoplasm}}$  Pyruvate  
 $\xrightarrow{\text{mitochondria}}$  Ethanol + Carbon dioxide
- (b) Glucose  $\xrightarrow{\text{cytoplasm}}$  Pyruvate  
 $\xrightarrow{\text{cytoplasm}}$  Lactic acid
- (c) Glucose  $\xrightarrow{\text{cytoplasm}}$  Pyruvate  
 $\xrightarrow{\text{mitochondria}}$  Lactic acid
- (d) Glucose  $\xrightarrow{\text{cytoplasm}}$  Pyruvate  
 $\xrightarrow{\text{cytoplasm}}$  Ethanol + Carbon dioxide

40. Which of the following is most appropriate for aerobic respiration?

- (a) Glucose  $\xrightarrow{\text{mitochondria}}$  Pyruvate  
 $\xrightarrow{\text{cytoplasm}}$   $\text{CO}_2 + \text{H}_2\text{O} + \text{Energy}$
- (b) Glucose  $\xrightarrow{\text{cytoplasm}}$  Pyruvate  
 $\xrightarrow{\text{mitochondria}}$   $\text{CO}_2 + \text{H}_2\text{O} + \text{Energy}$
- (c) Glucose  $\xrightarrow{\text{cytoplasm}}$  Pyruvate + En-  
 ergy  $\xrightarrow{\text{mitochondria}}$   $\text{CO}_2 + \text{H}_2\text{O}$
- (d) Glucose  $\xrightarrow{\text{cytoplasm}}$  Pyruvate + En-  
 ergy  $\xrightarrow{\text{mitochondria}}$   $\text{CO}_2 + \text{H}_2\text{O} + \text{En-}$   
 ergy

41. The information acquired at the end of the dendritic tip sets off a chemical reaction. This creates an / a

- (a) action  
 (b) reaction  
 (c) electrical impulse  
 (d) potential

42. The chemicals cross a region called

- (a) synapse  
 (b) reflex arc  
 (c) impulse  
 (d) reception

43. Which of the following statement(s) is/are true about respiration?
- (i) During inhalation, ribs move inward and diaphragm is raised.
  - (ii) In the alveoli, exchange of gases takes place i.e., oxygen from alveolar air diffuses into blood and carbon dioxide from blood into alveolar air.
  - (iii) Haemoglobin has greater affinity for carbon dioxide than oxygen.
  - (iv) Alveoli increase surface area for exchange of gases.
- (a) (i) and (iv)
  - (b) (ii) and (iii)
  - (c) (i) and (iii)
  - (d) (ii) and (iv)
44. Which is the correct sequence of air passage during inhalation?
- (a) Nostrils → larynx → pharynx → trachea → lungs.
  - (b) Nasal passage → trachea → pharynx → larynx → alveoli.
  - (c) larynx → nostrils → pharynx → lungs → trachea.
  - (d) Nostrils → pharynx → larynx → trachea → alveoli.
45. Which of the following statement(s) is/are true about heart?
- (i) Left atrium receives oxygenated blood from different parts of body while right atrium receives deoxygenated blood from lungs.
  - (ii) Left ventricle pumps oxygenated blood to different body parts while right ventricle pumps deoxygenated blood to lungs.
  - (iii) Left atrium transfers oxygenated blood to right ventricle which sends it to different body parts.



- (iv) Right atrium receives deoxygenated blood from different parts of the body while left ventricle pumps oxygenated blood to different parts of the body.
- (a) (i)  
 (b) (ii)  
 (c) (ii) and (iv)  
 (d) (i) and (iii)
46. The nervous tissue is made up of
- (a) nephrons  
 (b) neurons  
 (c) cells  
 (d) capillaries
47. The process of detecting the input and a quick response to it is called
- (a) impulse  
 (b) action  
 (c) sensation  
 (d) reflex arc
48. Which of the following equations is the summary of photosynthesis?
- (a)  $6\text{CO}_2 + 12\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$   
 (b)  $6\text{CO}_2 + \text{H}_2\text{O} + \text{Sunlight} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 + 6\text{H}_2\text{O}$   
 (c)  $6\text{CO}_2 + 12\text{H}_2\text{O} + \text{Chlorophyll} + \text{Sunlight} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$   
 (d)  $6\text{CO}_2 + 12\text{H}_2\text{O} + \text{Chlorophyll} + \text{Sunlight} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{CO}_2 + 6\text{H}_2\text{O}$
49. Choose the forms in which most plants absorb nitrogen
- (i) Proteins  
 (ii) Nitrates and Nitrites  
 (iii) Urea  
 (iv) Atmospheric nitrogen
- (a) (i) and (ii)  
 (b) (ii) and (iii)  
 (c) (iii) and (iv)  
 (d) (i) and (iv)

50. Which of the following statement(s) is/are correct?
- (i) Pyruvate can be converted into ethanol and carbon dioxide by yeast.
  - (ii) Fermentation takes place in aerobic bacteria.
  - (iii) Fermentation takes place in mitochondria.
  - (iv) Fermentation is a form of anaerobic respiration.
- (a) (i) and (iii)
  - (b) (ii) and (iv)
  - (c) (i) and (iv)
  - (d) (ii) and (iii)
51. The communication between CNS and other parts of the body is facilitated by
- (a) peripheral nervous system
  - (b) brain
  - (c) spinal cord
  - (d) reflexes
52. The main thinking part of the brain is
- (a) fore-brain
  - (b) mid-brain
  - (c) hind-brain
  - (d) medulla oblongata
53. Choose the correct path of urine in our body
- (a) kidney → ureter → urethra → urinary bladder.
  - (b) kidney → urinary bladder → urethra → ureter.
  - (c) kidney → ureters → urinary bladder → urethra.
  - (d) urinary bladder → kidney → ureter → urethra.
54. Electrical impulse travels in a neuron from
- (a) dendrite → axon → axonal end → cell body.
  - (b) cell body → dendrite → axon → axonal end.
  - (c) dendrite → cell body → axon → axonal end.
  - (d) axonal end → axon → cell body → dendrite.

55. Which is the correct sequence of the components of a reflex arc?
- (a) Receptors → muscles → sensory neuron → motor neuron → spinal cord.
  - (b) Receptors → motor neuron → spinal cord → sensory neuron → muscle.
  - (c) Receptors → spinal cord → sensory neuron → motor neuron → muscle.
  - (d) Receptors → sensory neuron → spinal cord → motor neuron → muscle.
56. Involuntary actions like blood pressure, vomiting and salivation are controlled by
- (a) cerebral cortex
  - (b) spinal cord
  - (c) central nervous system
  - (d) medulla in the hind brain
57. The brain is protected by
- (a) cranium
  - (b) vertebral column
  - (c) spinal cord
  - (d) joints
58. Activities like walking in a straight line, riding a bicycle, picking up a pencil are controlled by
- (a) cerebrum
  - (b) cerebellum
  - (c) medulla oblongata
  - (d) spinal cord
59. The element required for the thyroid gland to make Thyroxine hormone is
- (a) calcium
  - (b) phosphorus
  - (c) iodine
  - (d) magnesium
60. Which of the following statement(s) is/are true?
- (i) Sudden action in response to something in the environment is called reflex action.

- (ii) Sensory neurons carry signals from spinal cord to muscles.
  - (iii) Motor neurons carry signals from receptors to spinal cord.
  - (iv) The path through which signals are transmitted from a receptor to a muscle or a gland is called reflex arc.
  - (a) (i) and (ii)
  - (b) (i) and (iii)
  - (c) (i) and (iv)
  - (d) (i) , (ii) and (iii)
61. Which of the following statement(s) is/are true about the brain?
- (i) The main thinking part of brain is hind brain.
  - (ii) Centres of hearing, smell, memory, sight etc are located in fore brain.
  - (iii) Involuntary actions like salivation, vomiting, blood pressure are controlled by the medulla in the hind brain.
  - (iv) Cerebellum does not control posture and balance of the body.
  - (a) (i) and (ii)
  - (b) (i), (ii) and (iii)
  - (c) (ii) and (iii)
  - (d) (iii) and (iv)
62. Adrenal glands are located above these organs
- (a) kidneys
  - (b) lung
  - (c) intestine
  - (d) stomach
63. The sugar level in the blood is controlled by
- (a) adrenal gland
  - (b) thyroid gland
  - (c) pancreas
  - (d) liver
64. The changes associated with puberty in males & females is due to the secretion of
- (a) estrogen / testosterone