



Reproduction, Control and Coordination

All the organisms reproduce to continue their existence on the earth. The production of new organism from the existing organisms of the same species is called reproduction. It is a necessary process to maintain the life on the earth. There are several ways through which animals can produce offspring. The two main methods of reproduction are sexual and asexual.

Sexual Reproduction

The production of new organism with the use of their sex gametes is called sexual reproduction. This type of reproduction requires two parents who donate genes to the young one, resulting in offspring with a mix of inherited genes. Humans, animals and many other organisms reproduce by this method. Many flowering plants also reproduce by this method.

Asexual Reproduction

The production of new organism without the involvement of sex gametes is called asexual reproduction. In this type of reproduction, only a single parent is required.

Types of Asexual reproduction:

Fragmentation

In fragmentation, parent breaks different fragments, which eventually forms new individuals. For example, spirogyra.

Regeneration

In regeneration, when an animal that is capable of regeneration loses a body part, it can grow a replacement part. If the lost body part contains enough genetic information from the parent, it can regenerate into an entirely new organism. For example, sea stars, flatworms, etc.

Budding

In budding, a bulb-like projection or outgrowth arises from the parent body known as bud which detaches and forms a new organism. These buds develop into tiny individuals and when get fully mature.

Vegetative propagation

In this type of reproduction, any vegetative part of the plant body like leaf, stem or root develops into a complete new plant. For example, leaf in bryophyllum, stem in rose, bulb in onion, etc.

Spore formation

In this mode of reproduction, the organism breaks up into a number of pieces or spores, each of which eventually develops into an organism. Spore formation is a mode of reproduction resembling multiple fission. For example. Ferns, Mosses, Rhizopus, etc.

Sexual Reproduction in Flowering Plants

In sexual reproduction, the male cell produced by the male part of the flower and female cell produced by the female part of the flower fuses together. The male and female cells are called gametes. The fusion of male and female gametes is known as fertilization and leads to the formation of single cell, called zygote. The zygote divides repeatedly and gives rise to a new individual.

Structure of a flower:

The flower consists of four whorls. The outermost whorl consists of sepals. Then next is petals. Then after that comes stamens and at the centre is the female whorl, called pistil. The pistil can consist of one or many carpels. The carpel has a stalklike style with a sticky tip called the stigma and swollen base called ovary. Inside the ovary, there exists egg like ovules.

All flowers do not have all the four whorls. Flowers having all the four whorls are called perfect or complete flowers. Some flowers do not have pistil or female part. These flowers are called male flowers. Similarly, some flowers do not have stamens called female flower. A flower which lacks either stamen or pistil is called an incomplete flower or

unisexual flower. Flowers of hemp, watermelon, cucumber, bottle gourd, etc. are unisexual. The flowers of gulmohur, lily and China rose are complete or bisexual flowers.

Pollination

The stamen has a stalk like filament. At the head of the stamen is a pollen sac or anther. The mature anther burst and produces large number of dusty pollen grains. For reproduction to occur, the pollen grains must be transferred to the stigma of a carpel. This transfer of pollen grains from the anther to the stigma is called pollination. The pollen grains stick to the body of insects and birds that sits on flower. When these birds or insects visit another flower, some of the pollens are dusted off on to the stigma. The wind can also carry pollens from one flower to another.

Pollination is of two types, namely self-pollination and cross pollination. Self-pollination occurs when the pollens are transferred from the stamen to the pistil of the same flower. Cross pollination occurs when the pollen is transferred from the stamens of one flower to the pistil of another flower of the same kind of plant. Self-pollination can occur only in bisexual flowers. Cross pollination is much more common than self-pollination. All unisexual flowers are cross pollinated.

Fertilization

When the pollen grains reach the stigma, it germinates and grows a long thin tube called pollen tube. The pollen tube carries the male gamete produced by the pollen grain. The pollen tube pushes through the style into the ovary. The male gamete then enters the ovule, which contains the female gamete or egg. After the fusion of the two gametes, the ovary develops into the fruit and each ovule develops into a seed. Inside the seed lies the baby plant which develops from the zygote.

Dispersal of seeds

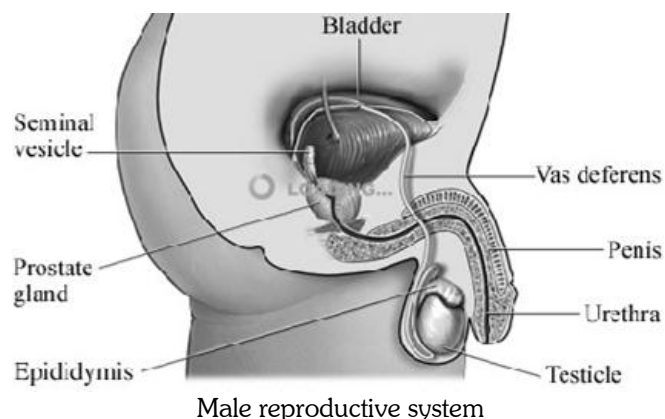
New plants can grow from seeds. The seeds can be scattered or dispersed by wind, water, animals or exploding fruits. For example, the plants such as, drumstick and maple have winged seeds and are carried by the wind. The seeds of lotus and water chestnut are dispersed by water. Birds and animals such as monkeys eat fruit from plants and throw away seeds. Fruits of rubber tree, balsam and night jasmine explode on ripening. This bursting of fruit scatters seeds away from the parent plant.

Reproduction in Human Beings

Human beings reproduce by using the sexual mode of reproduction.

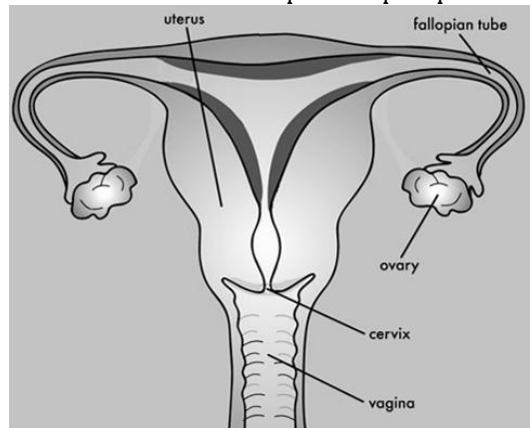
Male Reproductive System

The male reproductive system consists of the following organs: a pair of testes, a pair of epididymis, a pair of vas deferens, urethra, penis and accessory glands. In a person who has reached sexual maturity, the two testicles or testes produce and store millions of tiny sperm cells. The testicles are part of the endocrine system because they produce hormones, including testosterone. Testosterone plays a major role in puberty in boys. Testosterone is the hormone that is responsible for developing deeper voice, bigger muscles and body and facial hair. It also helps in stimulating the production of sperms.



Female Reproductive System

The organs of female reproductive system are: a pair of ovaries, oviducts, uterus and vagina. Ovaries are the main reproductive organs. They make mature female gametes. Each ovary is composed of thousands of follicles. Oviducts are like tubes. The oviducts are connected to uterus. It is the uterus where growth and development of a fertilized ovum takes place. Vagina is tubular structure that receives penis to put sperm inside.



Coordination is the process of working together of the various organs of an organism in a systematic manner so that a proper response to the stimulus can be produced.

Control and Coordination in Animals

Control and coordination in higher animals takes place through their nervous systems. This system controls all the activities such as body movement, behaviour, thinking, etc. For example, then you touch a hot object, you withdraw your hand immediately. It is not your deliberate response. It is the response of our control and coordination system. All information from our environment is detected by the specialised tips of some nerve cells. In our body there are sense organs or receptors and effectors. The receptors are usually located in our sense organs such as the inner ear, the nose, the tongue and so on. These receptors perform various functions. For example, gustatory receptors detect taste while olfactory receptors detect smell. The effectors are the muscles and glands of our body that respond to a stimulus as per the order from nervous system.

We have five types of receptors:

- ❖ Photoreceptors - sensitive to light
- ❖ Phonoreceptors - sensitive to sound
- ❖ Olfactoreceptors - Sensitive to smell
- ❖ Thermoreceptors - sensitive to temperature
- ❖ Tangoreceptors - sensitive to touch.

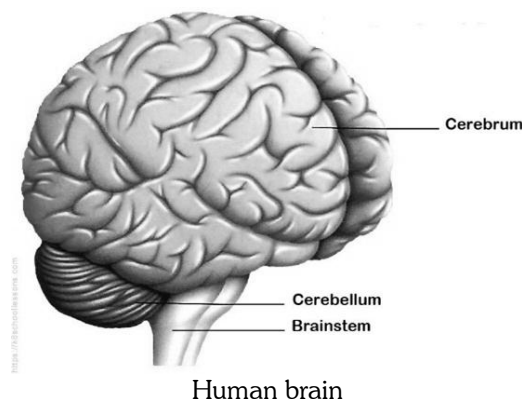
Human Brain

Humans are considered as the finest and the best creation of nature simply because they have most developed brain. Their brains are the control centre of the human nervous system. Human brain is a highly complex organ. It is situated in the cranium of the skull. Brain is surrounded by membranes and the space between membranes is filled with a fluid that protects the brain from mechanical shock. Our brain is divided into three parts such as forebrain, midbrain and hindbrain.

DIVISION	MAIN COMPONENTS
Forebrain	Olfactory lobes, cerecrum, diencephlon
Midbrain	optic lobes
hindbrain	pons, cerebellum, medulla medulla oblongata

The human brain contains 50-100 billion neurons, of which about 10 billion are cortical pyramidal cells. These cells pass signals to each other via approximately 100 tri llion synaptic connections. Inspite of the fact that it is protected by the thick bones of the skull, suspended in cerebrospinal fluid and isolated from the bloodstream by the blood-

brain barrier, the delicate nature of the human brain makes it susceptible to many types of damage and disease. The following figure shows the brain of human being and its parts:



Control and coordination in plants

Plants do not move place to place physically. They show movements in their body parts. Generally plants show two types of movements. The first is dependent on growth and the second independent of growth.

Plants show tropism. Tropism is a growth movement of a plant part in response to an external stimulus in which the direction of a stimulus determines the direction of response. Thus tropism is a directional movement of the part of a plant caused due to its growth. For example, the shoot of a growing plant moves towards the light, while root of a plant moves away from light.

Types of Tropism

- **Phototropism:** It is the movement of a part of plant in response to light. For example, the stem of a growing plant bends towards the light. This bending is called positive phototropism whereas root of a plant moves away from light. This is called negative phototropism.
- **Geotropism:** It is the movement of a plant part in response to gravity. For example. The roots of a plant move downwards in the direction of gravity.
- **Chemotropism:** It is the movement of a part of plant in response to chemicals. The growth of pollen tubes towards ovules during the process of fertilisation.
- **Hydrotropism:** It is the movement of a plant part in response to water. For example, The root of a plant always grows towards water.
- **Thigmotropism:** It is the directional movement of a plant part in response to the touch of an object.

There are some plants called climbing plants. These plants have weak stems. They cannot stand erect on their own. They have climbing organs called tendrils. Tendrils are thin, thread like structures on the stem or leaves of climbing plants. Tendrils are sensitive to touch. When they come in contact with an object, they wind around the object and cling to it. This is due to the movement of a tendril towards the object.

Hormones in Plants

Different plant hormones help to coordinate growth, development and responses to the environment. They are produced at places away from where they act simply diffuses to the area of action.

Types of Hormones

- **Auxin:** It is produced at the shoot tip. It helps plant to grow. It promotes cell enlargement and cell differentiation in plants.
- **Gibberellin:** It helps in the growth of the stem along with Auxin.

- **Cytokinin:** It promotes cell division. It is present in large amount in areas of rapid cell division, such as fruits and seeds. It promotes the opening of stomata.
- **Absciscic acid:** It inhibits growth. It effects wilting of leaves. It also promotes the closing of stomata.