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HOW DO ORGANISMS REPRODUCE

INTRODUCTION

One of the most important aspect of living thing is their ability to produce their own kind. In the life of an organism there comes a time when its powers of metabolism, growth, responsiveness become insufficient to maintain its complex body against other unfavourable forces such as attack by predators, parasites, starvation, changes in environment, aging. All these results ultimately in tie death of the organism. However, the species of the organism survives for periods far greater than the life time of an individual. This survival of species is accomplished with the production of new individuals by the old before the old die. This is called reproduction.

In living world the reproduction is exhibited in many forms. Many animals such as dog, cat, man reproduce many times during their life period. The fish reproduces only once in life and the adult eels, after reproducing die. In beehive the male bee called as drones mate with females and quickly die. The queen bees are fertile females. They are reproductive mothers. All other bees are sterile and never reproduce. Such examples illustrates that an organism may reproduce repeatedly or it may reproduce once and die or it may not reproduce at all. This shows that reproduction is not essential to the life of any individual. It is a function essential for the maintenance of a species.

In human beings, the process is one of sexual reproduction, which involves both male and female sexes. The new individual or offspring develops from the fusion cell called zygote, which is formed, by the fusion or union of two specialized cells called germ cells, sex cells or gametes.

Generally, one of the gametes is active, smaller in size and without any reserve food. This is the male gamete and it is called the sperm . In various other organisms it reproduction method may be asexual. Whatever may be the form of reproduction, it always has certain characteristics.

(i) Reproduction maintains the continuity of life – By reproduction life perpetuates itself. Each new organism develops from a fragment of protoplasm derived from one parent or from fragments derive from two parents (male and female).

(ii) Reproduction is Specific – A dog produces pups, a neem seedling produced from neem tree, human being produces infant of its own type. Thus each species produces only its own kind.

(iii) Reproduction is cellular – Each organism begins life from one or several cells. These cells are derived from parental generation.

(iv) Reproduction is developmental – Dog, cat, parrot, they are all having body which is complex in structure. A dog's pup which is equally complex as adult dog is not produced as such directly. It develops from a single cell. This cell is capable of becoming a pup. Thus between this cell and pup there occurs long process of development.

Animals and plants manage to make copies of themselves from one generation to the next. Scientists knew that genes carried the hereditary characteristics by means of substances inside the nucleus of the cell, but how was this done? The mystery was gradually revealed from the early 1940s to the early 1960s. Genes are made up of DNA(Deoxyribo Nucleic Acid), which carries the blueprint for inheritance.

MODES OF REPRODUCTION

We now know that each new organism-whether a single celled Amoeba or an alga or a neem tree or a man-begins life as a single cell. If this cell is derived from one parental cell then this form of reproduction

is called as Asexual. When two parents cells or cell nuclei fuse to form the beginning cell of the new organisms – this is called sexual reproduction.

Is sexual reproduction better than asexual reproduction ? The answer seems to depend on the environment in which an organism lives. Sexual reproduction leads to offspring that differ genetically from their parents. As a result, sexual reproduction may work best when offspring must survive in a habitat that differs from the one in which their parents were successful. Thus, the species that stand to benefit most from sexual reproduction either have young that move away from their parents to live in slightly different habitats, or have long-lived individuals whose habitat changes from the time of their parents lives to the time when their own offspring develop. In contrast, the recombination of genes that characterizes sexual reproduction may be a disadvantage for species in which the offspring develop under conditions identical to those in which their parents thrived.

Chromosomes in the nuclei tiny objects were deeply involved with inheritance. The chromosomes carried the genes, and it was the genes passing from parents to children that carried all the characteristics of that particular organism.

With DNA located in the chromosomes, therefore DNA have to do with Inheritance. During reproduction copies of DNA are created accommodated with cell division and variation. Variation during reproduction give base to evolution.

THE IMPORTANCE OF VARIATION

No two individuals of a species are identical. Variations may be due to genetic or environmental differences, or simply to chance. The presence of these differences dictates that the description of a single individual is not sufficient to describe an entire species morphology, ecology, development, or anything else. Instead, the description of many individuals taken together defines a range of variation that encompasses the species.

Variation in morphology between individuals of the same species is the most obvious kind of variation.

Most studies of evolution, especially those based on the study of fossils, rely exclusively on morphological variation. However, many aspects of organisms may vary, including behavior, ecology, genetic makeup, and growth patterns.

Types of variation : Variation within a population may be of four types: (1) age-group (ontogenetic) differences; (2) genetic differences; (3) environmental differences; and (4) chance.

(1) Age-group differences are those differences produced by the presence of individuals of different ages in a population,

(2) Different individuals typically possess different sets of genes.

Some variation within a population is clearly the expression of these genetic differences. Hair color, eye color, and number of fingers are all human genetic traits that vary.

(3) Environmental differences are those attributable to outside influences on an organism. Flowering plants are especially plastic in their responses to the environment. This type of variation is controlled by the local environment established inside the colony rather than by outside influences. Depending on how she is cared for, a female ant larva may develop into a worker, a soldier, or a queen.

(4) Chance plays a role in each of the three types of variation listed above. Some variation is simply the result of random changes in the genetic code or chance exposure to certain events or environments. For example, identical twins, although they possess the same set of genes, have different fingerprints due to the random effects of cell division. Randomness is an integral part of all aspects of biological systems.

Those organisms which survive to successfully reproduce will be those with features that happen to be better suited to local conditions at that time. Heritability ensures that at least some of these features will be passed on to the next generation.

Therefore, individual variation is the raw material upon which natural selection acts. Through differential birth or death of individuals, the mean of a population will tend to shift toward whatever variants are most adaptive for that particular time and place. This is natural selection.

ASEXUAL REPRODUCTION

Each new organism whether it is a unicellular animal or plant or multicellular tree or man, begins life as a single cell. If this cell is derived from one parental cell then this form of reproduction is known asexual reproduction.

Fission : Majority of unicellular organisms reprod by Fission. The cell divides into two or more daughter cell which then grow to full size. Reproduction by fission is found in bacteria, protozoa and some forms of algae. Fission in Paramecium is binary. The cell divides in a particular flow to produce two equal daughter cells. Thus various types of fission are the only means of asexual reproduction in unicellular organisms.

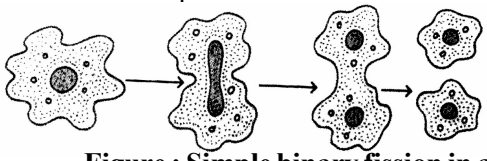

Figure : Simple binary fission in amoeba

In many lower plants the nucleus divides several times into many daughter nuclei. A bit of cytoplasm is gathered around each daughter nucleus developing an outer membrane. It functions as cell membrane. Finally the multinucleated body is divided and developed into as many individuals as the number of daughter nuclei. This type of fission where several individuals arise is called multiple fission. Example– plasmodium, many algal members.

Budding : It is a type of fission in which the nucleus divides equally between the daughter cells but the cytoplasm divides unequally and smaller part act as bud or small outgrowth from the parent cell. The bud after separating develops into full organisms. Such budding is found in fungi like yeast and in certain bacteria. Multicellular Coelenterates like Hydra produce multicellular buds, which separates and grow into a new Hydra.

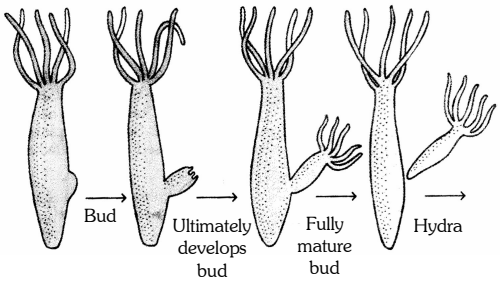

Figure : External budding in hydra

Yeast is a unicellular fungal organism employed in bakery. During budding a small bulge or spherical protuberance appears on the surface of yeast cell, usually on the upper side as an outgrowth, known as bud. Now the nucleus situated in the yeast cell divides into two daughter nuclei. One of them moves into the bud whereas one remain in the cell. After sometime the bud grows into an adult cell and detaches from the mother cell. The detached bud live as an independent individual. Sometimes a chain of buds can be formed on the mother cell. Finally all buds detach and live independently.

In Hydra outgrowth is formed at any part of the body by repeated division of the cells, called buds. The bud grows gradually on the parent Hydra, develops into new Hydra and separates.

Fragmentation : Many fungi can reproduce by fragmentation. Any mycelium that is fragmented or disrupted, provided that the fragment contains the equivalent of the peripheral growth zone, can grow into a new colony. In fragmentation a plant cell is divided into two or more parts and each part is developed into a new plant. In lower plants like Spirogyra, Oscillatoria and other similar filamentous algae asexual reproduction is accomplished by the breaking of the filament.

Spores : In members of plant groups like Fungi, Algae, Bryophyta and Peteredophyta, asexual reproduction occur by special structures called spores. The cell producing spores is commonly called as Sporangla.

In unicellular alga–Chlamydomonas 4-8-16 daughter cells are formed. This is also called multiple fission. The daughter cells so formed are called as spores. After being liberated from the mother cell, they swim freely in water with the help of anterior flagella. In favourable condition each such spore develops into a new Chlamydomonas. The spore which posses organ for movement such as flagella in this example, are called as motile spores.

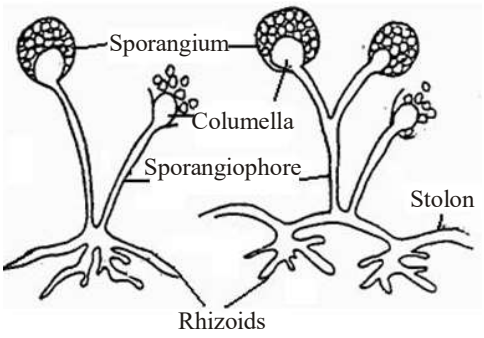

Figure : Asexual reproductive structures of Rhizopus

In Bryophytes and Pterdophytes asexual reproduction occur by non-motile spores. In Moss-a Bryophyte the haploid spores are formed in a special structure called sporogonium. In Pteridophytes like ferns the spore producing sporangia are borne in groups on the lower or underside of the leaf. After the dehiscence of sporangia these spores are dispersed by air and in favourable condition they form the new haploid plant the prothallus. Spores without organ of locomotion are called non-motile-spores.

The Spores are usually very light with a protective wall around them. The small size and light weight enables them to be carried to great distances by air currents. Spores are therefore, agents of dispersal spreading the organism to new location.

Regeneration : Regeneration is the ability to replace lost or damaged body parts. This ability varies greatly among living things. Plants can regenerate all body parts from precursor cells. Many trees, for example, can be cut off at the ground and, in due course, sprouts appear at the margins of the stump. These go on to develop new stems, leaves, and flowers.

Planarians : These flatworms can regenerate the entire body from just a small piece. They do this by the proliferation and differentiation of the totipotent stem cells that it retains in its body throughout its life.

Planaria has highly robust regeneration system. When its part of body is cut, each piece of the part regenerates itself. In some cases, it gets two heads or two tails. In other cases, it gets two tails.

When a planaria's head is cut off, the remaining tail section will first regenerate a head. Even if the cut is made very close to the tail, the small tail section first regenerates the head and then continues to regenerate the rest of the tissue between the head and the tail. Regeneration can be seen in lizards also.

Interesting :

1. The human liver is one of the few glands in the body that has the ability to regenerate from as little as 25% of its tissue.
2. Children up to the age of 10 or so who lose fingertips in accidents can regrow the tip of the digit within a month provided their wounds are not sealed up with flaps of skin.

VEGETATIVE REPRODUCTION

Higher plants reproduce asexually by vegetative organs such as leaf, stem or root. Vegetative reproduction occur naturally. This fact have been made use of by man for his own benefit. Gardeners often fragment plants deliberately in order to reproduce desired variety. Thus vegetative reproduction can also be introduced artificially by farmers and gardeners.

Some plants such as Begonia and Bryophyllum (African violet) has dormant buds on leaf-margin. A plant can grow from a fallen leaf because of the sprouting of these buds. Gardeners place leaf cuttings in moist sand where they develop into new plants.

Underground stems of ginger, potato, onion, alocasia and colocasia are the agents of vegetative reproduction.

The underground stem of ginger called rhizome grows horizontally. The branches when break from old stem, each forms a new plant. The tuber of potato has dormant buds called 'eyes'. A piece of tube with 'eye' when sown in soil produces a new potato plant. This method is used for potato cultivation.

The aerial stem also reproduces vegetatively. In lawn grass and Brahmi, the stem and branches grow creeping along the ground surface and are called 'runners'. The runner when fragments, each fragment develops into a new plant. The lawns are prepared by small pieces of stem. In chrysanthemum, strawberry and mint the underground stem pieces also develop into a new plant. The basal part of old stem of sugarcane is used for cultivation of sugarcane. This part is called 'set'.

Sweet potato, poplar and black raspberry reproduce by roots.

There are numerous forms of vegetative reproduction, including:

• bulbs (e.g. daffodil) • rhizomes (e.g. couch grass) • runners (e.g. strawberry) • tubers (e.g. potato)

Artificial Vegetative reproduction : The vegetative reproduction have been exploited by man in horticulture, floriculture, silviculture and agriculture. Improved varieties of plants such has organ, mango, banana, sugarcane, potato, onion, rose, Jasmine, etc. are maintained and multiplied by means of vegetative reproduction.

Before making of vegetative reproduction, it is first ascertained that which part of the plant reproduce vegetatively in nature. That part is cut and planted in soil. After sometime the roots and buds sprout and a new plant is formed.

Advantages of induced vegetative reproduction :

1. Many useful plants do not produce seeds. Fro example Bananas, seedless grapes, seedless guava, navel oranges must be grown vegetatively.
2. It is quicker than growth from seeds.
3. It is more certain.
4. It is productive of a larger crop.
5. Vegetative offspring is a part of the parent with same heredity. Therefore, it shows no major variation from parents desirable characteristics.

Advantages of Asexual Reproduction : Asexual reproduction can be very advantageous to certain animals. For instance, animals that remain in one particular place and are unable to look for mates would need to reproduce asexually. Another advantage of asexual reproduction is that numerous offspring can be produced without "costing" the parent a great amount of energy or time. Environments that are stable and experience very little change are the best places for organisms that reproduce asexually. The cloned offspring are more likely to succeed in the same stable areas as their parents.

SEXUAL REPRODUCTION

Sexual reproduction involves an exchange of genetic material between two organisms. There are a variety of methods by which the exchange can take place.

Advantages of Sexual Reproduction : The largest organism discovered on the planet is a mushroom, whose underground, branching filaments cover 2200 acres in eastern Oregon. Nearly all of this organism was produced by mitotic cell division. Clearly, asexual reproduction via mitotic cell division must work pretty well! Why, then, have nearly all known forms of life, even the simplest, evolved ways of sexual reproduction? Mitosis can only produce clones, genetically identical offspring. In contrast, sexual reproduction enables reshuffling of genes among individuals to produce genetically unique offspring. The nearly universal presence of sexual reproduction is evidence of the tremendous evolutionary advantage that DNA exchange among individuals confers on a species.

Mutations in DNA Are the Ultimate Source of Genetic Variability :

The fidelity of DNA replication and proofreading minimizes the number of errors, but changes in DNA base sequences do occur producing mutations. Although most mutations are neutral or harmful, they are also the raw material fori evolution. Bacteria are different from bison, and you are different from your predecessors, because of differences in DNA sequence that originally arose as mutations. Mutations are perpetuated by DNA replication. Unless they are lethal, mutations are passed to offspring and become a part of the genetic makeup of each species. Such mutations form alleles, alternat, forms of a given gene that confer variability on individuals, such as black, brown, or blond hair.

SEXUAL REPRODUCTION IN FLOWERING PLANTS

Flower structure : Complete flowers have four types of structures, all of which are modified leaves. Each type of structure forms a whorl, or circle,

around the end of the flower stalk. The calyx is the outermost whorl of a flower. It consists of green, leaflike sepals, which enclose and protect the inner floral parts. Inside the calyx is the corolla, which is a whorl of petals. Large, colorful petals attract pollinators to the flower. The calyx and the corolla do not play a direct role in sexual reproduction and are therefore considered accessory parts of the flower.

The two innermost whorls of a flower, the androecium and the gynoecium, are essential for sexual reproduction. The whorl within the corolla, the androecium, consists of male reproductive structures called stamens, which are stalk like filaments that bear pollen-producing oval bodies called anthers at their tips. The whorl at the center of a flower, the gynoecium, consists of the female reproductive structures or pistil. The gynoecium forms from one or more carpels, which are leaflike structures enclosing the ovules. The bases of carpels and their enclosed ovules make up the ovary. The upper part of the carpels are stalklike styles that bear stigmas at their tips. Stigmas receive pollen.

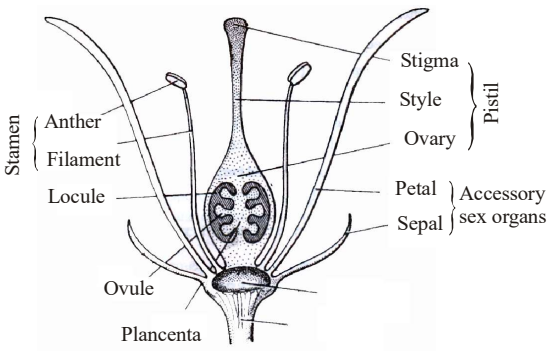

Figure : Structure of Flower

Plant Reproduction and the Wandering Wasp :

Newly emerged from his cocoon, the male wasp seeks a mate, although the females will not emerge for another week. The male wasp flies among orchid plants of genus Ophrys. Suddenly, he becomes intensely excited: the unmistakable fragrance of a sexually receptive female wasp wafts from the orchid flowers. The sexually stimulated wasp approaches the blooms more closely. To his eyes, which can discern ultraviolet light invisible to humans, one petal of each flower looks like a female wasp with eyes, antennae, and wings.

The male alights on the petal, which not only looks and smells like a female but whose fuzzy surface feels like a potential mate. He begins the motions of copulation, and in the process, ends up with small packets of pollen on his head. The agitated male soon moves to another flower. He tries again to mate with a petal, and in doing so, deposits some of the first flower's pollen.

The behavior of the male wasp seeking a mate and finding a flower may seem to waste biological energy, but it is an amazingly efficient mechanism for delivering pollen the male sex cells of flowering plants from one plant to another. Sexual reproduction in orchids and other flowering plants is intimately linked to certain animal behaviors. Flowers are complex biological structures that facilitate sexual reproduction, and thereby the recombination of genetic material, in certain plants. Plants can also reproduce asexually.

Pollination : Pollination is the transfer of pollen from an anther to a receptive stigma. Some angiosperms are self-pollinating, meaning that pollen grains are transferred from the anther to the stigma of the same flower. Other angiosperms are outcrossing species. In these plants, pollens grains from one flower are carried to the stigma of another flower.

Pollination in early seed plants : Early seed plants were pollinated passively, by the action of the wind. They simply shed great quantities of pollen, which were blown about and occasionally reached the vicinity of the ovules of the same species. For such a system to operate efficiently, the individuals of a given plant species must grow relatively close together. Otherwise, the chance that any pollen will arrive at the appropriate destination is very small. The vast majority of wind blown pollen travels less than 100 meters. This is insignificant compared with the long distances pollen is routinely carried by certain insects and other animals.
A few kinds of living gymnosperms (some gnetophytes and cycads) are insect pollinated. Therefore, it is possible that insect pollination may already have been established in the ancestor of angiosperms.

Pollination by Animals : Animals, visiting flowers of specific angiosperm species and spreading their pollen from individual to individual, have played an important role in the evolutionary success the group. It now seems clear that the earliest angiosperms, and perhaps their ancestors also, were insect pollinated, and the coevolution of insects and plants has been important for both groups for over 100 million years. Such interactions have also been important in bringing about increased floral specialization. As flowers become increasingly specialized, so do their relationships with particular groups of insects and other animals.

Bees and Flowers : Among insect-pollinated angiosperms, the most numerous are those pollinated by bees . Like most insects, bees locate sources of food initially by odor, then orient themselves on the flower or group of flowers by its shape, color, and texture. Flowers that are characteristically visited by bees are often blue or yellow. Many have lines of dots or stripes that indicate location of the nectaries, which are often located within the throats of specialized flowers. Some bees collect nectar, which is used as a source of food for adult bees and occasionally for larvae. Most of the approximately 20,000 species of bees visit flowers to obtain pollen. Pollen is used to provision cells in which bee larvae complete their development.

Insects other than Bees : Among flower-visiting animals other than bees, a few groups are especially prominent. Flowers that are visited regularly by butterflies, like phlox, often have flat "landing platforms" on which butterflies perch. They also tend to have long, slender floral tubes filled with nectar that is accessible to the long, coiled proboscis characteristic of Lepidoptera, the order of insects that includes butterflies and moths. Flowers visited regularly by moths are often pale in color, white or yellow, like jimsonweed or evening primrose, and heavily scented, thus serving to make the flowers easy to locate at night.

Pollination by birds : A particularly interesting group of plants are those regularly visited and pollinated by birds. Such plants must produce large amounts of nectar. If they do not, the birds will not be able to find enough food to maintain themselves or will not continue to visit flowers of that plant, for energy reasons alone. If these flowers do produce large amounts of nectar it is not advantageous for them to be visited by insects, because the insects could supply their energy requirements at a single flower, Therefore, the plant would not be cross-pollinated as a result of the insect's visit.

Wind-Pollinated Angiosperms : Many angiosperms, representing a number of different groups, have reverted to the wind pollination that was characteristic of early seed plants. Among them are such familiar plants as oaks, birches, cottonwoods, grasses, sedges, and nettles. The flowers of these plants are small, greenish, and odorless; their corollas are reduced or absent. Such flowers often are grouped together in fairly large numbers and may hang down in tassels that wave about in the wind and shed pollen freely.

Self-Pollination : All of the modes of pollination that we have considered thus far tend to lead to outcrossing, which is as highly advantageous for plants as it is for eukaryotic organisms generally. Notwithstanding this, self-pollination is also very frequent among angiosperms. In fact, probably more than half of the angiosperms that occur in temperate regions self-pollinate regularly. Most of these have small, relatively inconspicuous flowers in which the pollen is shed directly onto the stigma, sometimes even before the bud opens. You might logically ask why there are so many self-pollinated plant species if outcrossing is just as important genetically for plants as it is for animals. There are two basic reasons for the very frequent occurrence of self pollinated angiosperms.

Fertilization : After a pollen grain lands on a stigma (pollination), it produces a growing pollen tube. The pollen grain's two sperm cells enter the pollen tube as it grows through the tissues of the stigma and the style towards the ovary. When the pollen tube reaches an ovule, it discharges its two sperm cells into the embryo sac. One sperm nucleus fuses with the egg nucleus and forms a diploid zygote. After a series of cell divisions, the zygote becomes the embryo.

The second sperm cell nucleus fuses with the two polar nuclei and forms a triploid nucleus. A triploid cell has three complete sets of chromosomes. The triploid nucleus divides to form a tissue called endosperm, which is stored food for the developing embryo. Familiar endosperms are coconut milk the fleshy part of a kernel of com. Notice that the egg and the polar nuclei both are fertilized, a phenomenon termed double fertilization.

Seed Germination : Germination occurs when various structures within the seed function in an integrated way to induce the development and growth of an embryo into a new plant. During germination, the seed becomes transformed from a small, inert object into a highly organized seedling. The final stage of germination is somewhat analogous to animal birth after embryonic development is completed, the individual plant escapes from its protective container and begins an independent life. Besides being essential for the successful reproduction of wild plants, crops, and garden plants, germination results in the development of certain products that have economic importance for human beings. For example, malt is produced from germinating barley seeds and has many important uses, including the brewing of beer.

A seed faces a demanding series of transitions before it can grow into a seedling. After formation, most seeds dry out but there is great species variation in the events that follow. In some species, both the fruit and the enclosed seeds dry out, whereas in others, the seeds dry slowly after they have been released from a moist, fleshy fruit. Some plant species produce seeds that germinate soon after dispersal. The seeds of other species require passage through the digestive tract of an animal, where the seed coat is eroded by digestive juices, thereby freeing the embryo and allowing it to germinate soon after the animal eliminates it.

Initial Events of Germination : Germination begins after a seed absorbs water and when other necessary conditions have been met. The seed swells, and many of the metabolic processes essential for plant life begin. For example, in barley seeds, the cell layer located between the seed coat and the endosperm produces enzymes needed for growth. After being activated by tiny amounts of chemicals, known as plant growth regulators, these enzymes are released by the embryo and used in cellular respiration reactions and protein synthesis. Cellular respiration reactions allow the embryo to convert carbohydrates stored in the endosperm and cotyledons into energy required for growth. Protein synthesis provides the molecules that are necessary for constructing new cells and tissues during development and growth.

The first visible sign of germination is the appearance of the radicle after it expands, elongates, and then penetrates through the seed coat. As the radicle continues to elongate, it responds to gravity, turning downward and growing into the soil. As it becomes secured in the soil, the embryonic root absorbs the water and nutrients necessary for germination to continue.

Later Events of Germination Once the radicle is established, the shoot elongates and pushes up through the soil. After the shoot breaks through the soil surface, leaves form and begin to carry out photosynthesis.

This allows the new plant to produce the sugars it requires for cellular respiration and growth. When the rate of photosynthesis is great enough to satisfy the needs of the developing plant, the seedling is no longer dependent on stored energy reserves, which have usually been depleted by this time.

Signs of germination can be seen by walking through a forest, meadow, or other natural habitat during the spring. It is often possible to find newly emerged seedlings in various stages of development. Some still have remnants of their seed coats attached, others appear with their newly developed leaves, and some will have already developed many of the characteristics of the adult plant.

REPRODUCTION IN HUMAN BEINGS

Sexual reproduction in humans provides a good example of sexual reproduction in animals. As we all know, humans come in two genders: male and female. Males produce haploid sperm (containing 23 chromosomes) by meiosis in specialized organs called testes (singular testis). Human sperm can swim through fluid by means of a flagellum. Females produce haploid eggs (containing 23 chromosomes) by meiosis in organs called ovaries.

The female usually releases one egg from her ovaries each month, which moves down a tube called the oviduct. During intercourse, the male's penis directs almost 300million tiny sperm into the vagina of the female.

Massive numbers of sperm swim up the oviduct in response to a pheromone released by the ovary. The female aids the progress of the swimming sperm by a combination of muscular contractions of the reproductive tract and the release of chemicals that stimulate sperm to swim. However, only a few hundred sperm reach the egg in the oviduct. Only one of these sperm can successfully fuse with the egg because changes in the egg immediately after fusion prevent entry by other sperm. Fusion of the nucleus of the egg with that of the sperm produces a diploid zygote containing 46 chromosomes (23 pairs) that come equally from both parents.

The human reproductive system becomes active at a particular age called puberty period. Generally it is 13-14 years in boys and 10-12 years in girls. The human reproductive system is divided into two parts.

Male Reproductive System : The male reproductive system consists of the primary reproductive organs, the testes, and the secondary reproductive organs, which include the scrotum, epididymis, ductus deferens, seminal vesicles, urethra, prostate gland, bulbourethral glands, and penis. The male reproductive system performs the following functions:

1. **Production of sperm cells :** The reproductive system produces sperm cells in the testis.

   The testis lies within the scrotum and is covered on all surfaces except its posterior border by a serous membrane called the tunica vaginalis. This structure forms a closed cavity representing the remnants of the processus vaginalis into which the testis descended during fetal development
2. **Sustaining and transfer of the sperm cells to the female :** The duct system provides nutrients for the sex cells produced in the testes, provides an environment in which the sex cells mature, provides secretions that form most of volume of the semen transferred to the female, and transports the sex cells from the testes through the penis, which is a specialized organ that functions to deposit the sperm cells in the female reproductive system.
3. **Production of male sex hormones :** Hormones produced by the male reproductive system control the development not only of the reproductive system itself but also of the male body form. These hormones are also essential for the normal function of the reproductive system and reproductive behavior.

   The testes, which produce both sperm and male sex hormones, are located in the scrotum, a pouch that hangs outside the main body cavity. This location keeps the testes about 4°C cooler than the core of the body and provides the optimal temperature for sperm development. (Tight jeans push the scrotum up against the body, raising the temperature of the testes. Some researchers believe that wearing tight pants can reduce sperm counts and decrease fertility. This is not, however, a reliable means of birth control) Coiled, hollow seminiferous tubules, in which sperm are produced, nearly fill each testis. In the spaces between the tubules are the interstitial cells, which synthesize the male hormone testosterone.

Just inside the wall of each seminiferous tubule lie spermatogonia (singular, spermatogonium), the diploid cells from which the sperm eventually will arise, and the much larger Sertoli cells. Each time a spermatogonium divides, it can take one of two developmental paths. In the first developmental option, the cell may undergo mitosis. Mitosis ensures that the male has a steady supply of new spermatogonia throughout his life. Alternatively, the spermatogonium may undergo spermatogenesis that is, it may experience a series of developmental events that leads to the production of haploid sperm.

Spermatogenesis begins with the growth and differentiation of spermatogonia into primary spermatocytes, which are large diploid cells. The primary spermatocytes then undergo meiosis. At the end of meiosis I, each primary spermatocyte gives rise to two haploid secondary spermatocytes. Each secondary spermatocyte divides again, during meiosis II, to produce two spermatids, for a total of four spermatids per primary spermatocyte. Spermatids undergo radical rearrangements of their cellular components as they differentiate into sperm.

Sertoli cells regulate the process of spermatogenesis and nourish the developing sperm. The spermatogonia, spermatocytes, and spermatids are embedded in infoldings of the Sertoli cells. As spermatogenesis proceeds, they migrate up from the outermost edge of the seminiferous tubule to the central cavity of the tubule. The mature sperm are then liberated into the central cavity.

A human sperm is unlike any other cell of the body. Most of the cytoplasm disappears, leaving a haploid nucleus nearly filling the head. Atop the nucleus lies a specialized lysosome called the acrosome. The acrosome contains enzymes that will be needed to dissolve protective layers around the egg, enabling the sperm to enter and fertilize it. Behind the head is the midpiece, which is packed with mitochondria. These organelles provide the energy needed to move the tail which protrudes out the back. Whiplike movements of the tail, which is really a long flagellum, propel the sperm through the female reproductive tract.

In humans and other mammals, immature males do not produce sperm. Spermatogenesis does not begin until puberty, a period of rapid growth and transition to sexual maturity. At puberty, the hypothalamus releases gonadotropin-releasing hormone (GnRH), which stimulates the anterior pituitary to produce luteinizing hormone (LH) and follicle-stimulating hormone (FSH). Luteinizing hormone stimulates the interstitial cells of the testes to produce the hormone testosterone. Testosterone, in combination with FSH, stimulates the Sertoli cells and spermatogonia, causing spermatogenesis.

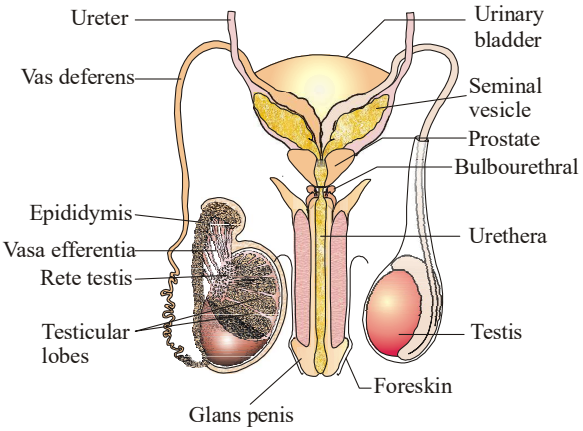

Figure : Diagrammatic view of male reproductive system (part of testis is open to show inner details)

Testosterone also stimulates the development of secondary sexual characteristics (such as the growth of facial hair in males and breast development in females), maintains sexual drive, and is required for successful intercourse (a term we will use for human copulation). Sperm, however, are not involved in these functions. Therefore, if FSH release could be suppressed, blocking spermatogenesis, while LH release continues, thereby allowing continued testosterone production, a man would be infertile but not impotent; in other words, he could not produce sperm but could maintain an erection of the penis, the male organ of copulation. Efforts are under way to develop a drug to do just that, as a form of male birth control.

Female reproductive system :

The female reproductive system is complex as compared to male reproductive system. The female reproductive organs include a pair of ovary, oviduct, uterus and vagina. A pair of ovary is situated on the dorsal side of abdominal cavity, below the kidney. Internally the ovary is made up of germinal epithelium cells which forms ova by meiosis. This formation of ova is called oogenesis.

Near each ovary is a funnel shaped structure called ostium which opens into muscular ciliated duct-oviduct. Both the oviducts join to form muscular sac like structure called uterus.

The embryo development takes place in the uterus.

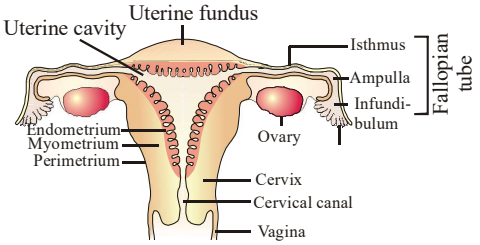

Figure : Diagrammatic sectional view of female reproductive system

The female reproductive system performs the following functions :

1. **Production of female sex cells :** The reproductive system produces female sex cells in the ovaries.
   The ovaries are the main reproductive organs of a woman. The two ovaries, which are about the size and shape of almonds, produce female hormones (oestrogens and progesterone) and eggs (ova). All the other female reproductive organs are there to transport, nurture and otherwise meet the needs of the egg or developing fetus. The ovaries are held in place by various ligaments which anchor them to the uterus and the pelvis. The ovary contains ovarian follicles, in which eggs develop. Once a follicle is mature, it ruptures and the developing egg is ejected from the ovary into the fallopian tubes. This is called ovulation. Ovulation occurs in the middle of the menstrual cycle and usually takes place every 28 days or so in a mature female. It takes place from either the right or left ovary at random.
2. **Reception of sperm cells from the male :** The female reproductive system includes structures that receive sperm cells from the male and transports the sperm cells to the site of fertilization.
3. **Nurturing the development of and providing nourishment for, the new individual :** The female reproductive system nurtures the development of a new individual in the uterus until birth and provides nourishment in the form of milk after birth.
4. **Production of female sex hormones :** Hormones produced by the female reproductive system control the development of the reproductive system itself and of the female body form. These hormones are also essential for the normal function of the reproductive system and reproductive behavior.
   In contrast to the testes, the ovaries develop much more slowly. In human embryos, the ovarian follicles, the functional units of the ovaries, do not appear until about day 105. Each follicle is a spherical structure containing the developing ovum and many small granulosa cells. At birth, a female's ovaries contain some 2 million ova, which have initiated meiosis. In prophase of the first meiotic division, however, meiosis is arrested. At this stage the ova are called primary oocytes. In the absence of significant levels of testosterone, the female embryo develops a clitoris and labia majora from the same embryonic structures that produce a penis and scrotum in males.
   At puberty, the granulosa cells begin to secrete estradiol (the major female sex hormone, or estrogen), triggering menarche, the Onset of menstrual cycling. Estradiol also stimulates the formation of the female secondary sexual characteristics, including breast development and the production of pubic hair. In addition, estradiol and another steroid hormone, progesterone, help to maintain the female accessory sex organs: the Fallopian tubes, uterus, and vagina.The Fallopian tubes transport ova from the ovaries to the uterus. In humans, the uterus is a muscular, pear-shaped organ that narrows to form a neck, the cervix, which leads to the vagina. The uterus is lined with a stratified epithelial membrane, the endometrium. The surface of the endometrium is shed during menstruation, while the underlying portion remains to generate a new surface during the next cycle.
   Mammals other than primates have more complex female reproductive tracts, where part of the uterus divides to form uterine "horns," each of which leads to an oviduct. In cats, dogs, and cows, for example, there is one cervix but two uterine horns separated by a septum, or wall. Marsupials, such as opossums, carry the split even further, with two unconnected uterine horns, two cervices, and two vaginas. The males of these species have a forked penis that can enter both vaginas simultaneously.

Menstruation : In females, during the puberty period, menstruation begins which indicates the start of female reproductive period. After the ova-production initiation, the cycle of activities, in ovary, initiates at definite time intervals. If fertilization does not occur after ovulation, the internal thick wall of uterus collapse along with blood vessels resulting in hemorrhage called menstruation. Its time duration is 4 to 7 days. It occurs repeatedly after 28-30 days. This is called menstrual cycle.

All the events that occur during the menstrual cycle the maturation and release of the egg and the increased thickness of the endometrium are intricately timed by a complex interaction of hormones, some of which we have already mentioned in the section concerning male sexual processes: gonadotropin releasing hormone (GnRH), follicle-stimulating hormone (FSH), and luteinizing hormone (LH), which is identical to the interstital cell-stimulating hormone (ICSH) active in males.

(ii) Oestrous Cycle : During this cycle, a desire for reproduction increases tremendously in females after ovulation. This cycle is found mostly in mammals.

MAJOR HUMAN REPRODUCTIVE HORMONES

Hormone	Source	Function
Male		
Testosterone	Interstitial cells of the testes; regulated by levels of ICSH.	Increases sperm production; stimulates development of male secondary sex characteristics.
Interstitial cell-stimulating hormone (ICSH) (see LH in the female)	Pituitary; secretion regulated by GnRH.	Stimulates the secretion of testosterone by interstitial cells of the testes
Follicle-stimulating hormone (FSH)	Pituitary; secretion regulated by GnRH.	Stimulates the development and maturation of the sperm in the semniferous tubules
Female		
Follicle-stimulating hormone (FSH)	Pituitary; release regulated by GnRH.	Maturation of the egg and follicle; development of the endometrium after menstrual flow increases secretion of estrogens.
Luteinizing hormone (LH)	Pituitary; release regulated by GnRH.	Continued development of follicle; corpus luteum formation; signals ovulation; increases secretion of progesterone.
Progesterone	Corpus luteum	Thickens and maintains the endometrium.
Estrogens	Ovarian follicle	Initiate thickening of endometrium; stimulate development of female secondary sex characteristics.
Prolactin	Pituitary; regulated by hypothalamic hormones.	Milk production by mammary glands.
Oxytocin	Pituitary; regulated by by hypothalamus.	Stimulates uterine contractions during labor and milk release
Embryo		
Human chorionic gonadotropin (HCG)	Chorion of the human embryo	Helps to maintain the corpus luteum; stimulates progesterone secretion in the corpus luteum and some estrogen secretion
Placental estrogen and progesterone	Human placenta: from the third month after fertilization	Helps to maintain pregnancy.

REPRODUCTIVE HEALTH

Within the framework of WHO's definition of health as a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity, reproductive health addresses the reproductive processes, functions and system at all stages of life. Reproductive health, therefore, implies that people are able to have a responsible, satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so.

Implicit in this are the right of men and women to be informed of and to have access to safe, effective, affordable and acceptable methods of fertility regulation of their choice, and the right of access to appropriate health care services that will enable women to go safely through pregnancy and childbirth and provide couples with the best chance of having a healthy infant

Sexually transmitted diseases (also known as STDs and once called venereal diseases or VD) are infectious diseases that spread from person to person through intimate contact. STDs can affect guys and girls of all ages and backgrounds who are having sex it doesn't matter if they're rich or poor

Interesting facts :

1. In the womb, the baby's body is covered by a thin layer of hair but as soon as the baby is born it disappears.
2. The largest cell in the female human body is the ovum or egg present in the ovaries
3. About 500 million sperm mature every day in a normal male adult.
4. The ovaries of a newborn girl contains about 600, 000 immature eggs.
5. The average life span of a sperm is about 36 hours.
6. The life span of an ova is about 12 - 24 hours.
7. The female human body is capable of giving birth to 35 children in one lifetime.

BIRTH CONTROL

Contraception, also called birth control, is the deliberate effort to halt conception a child (to keep a woman from becoming pregnant). Attempts to prevent pregnancy date back to ancient times and cultures. Some early methods of contraception involved techniques still used today. Gum arabic—a substance with which Egyptians coated tampons to kill sperm—is used to make spermicides contained in modern contraceptive jellies and foams. The ancient practice of prolonged nursing of infants to prevent conception of future children remains in current use, although it is by no means 100 percent effective. The modern diaphragm has its origin in a device made from bamboo that Asian women used as a barrier to the cervix (the opening to the uterus, or womb). The Chinese promoted "coitus interruptus," the withdrawal of the man's penis from the woman's vagina before ejaculation. Probably the most common contraceptive method in the world, this practice has resulted in numerous accidental pregnancies.

Contraceptive methods to prevent pregnancy:

• Barrier or mechanical methods • Hormonal methods • Natural methods

Barrier or mechanical methods include:

• Male condom • Female condom • Cervical Cap • Diaphragm
• Spermicidal Gel • Intra-uterine Device (IUD)

Hormonal methods include:

• The emergency contraception pill • The Pill (contraception pill) • Birth Control Patch
• Depo-Provera (injection) • Cervical Ring • Hormonal Intra-uterine Device

The natural methods include: • Abstinence • Natural family planning

The practice of using condoms to prevent pregnancy and sexually transmitted diseases began in the sixteenth century, when cloth condoms were promoted to protect against syphilis. By the eighteenth century, condoms were made of animal membrane, making them waterproof and more effective as birth control devices. Latex (rubber) condoms were first produced during the Industrial Revolution . The emergence of acquired immunodeficiency syndrome (AIDS) in the 1980s again resulted in the widespread promotion of condom use as an effective barrier to disease. Barrier methods keep sperm from entering the uterus and reaching the egg. In general, barrier methods are less effective but have fewer side effects than hormonal methods or IUDs. A male condom is a thin, flexible tube of latex rubber, polyurethane, or sheep intestine that has a closed end. The condom is placed over the erect penis before intercourse. A female condom is a tube of soft plastic (polyurethane) with a closed end. Each end has a ring or rim.

The ring at the closed end is inserted deep into the vagina over the cervix, like a diaphragm, to hold the tube in place. The ring at the open end remains outside the opening of the vagina.

Contraceptive devices that were developed in the late nineteenth century and are still used today include the diaphragm, a rubber cap that fits over the cervix and prevents the passage of sperm into the uterus; the contraceptive sponge, also a device used to cover the cervix before sexual intercourse; and foams and jellies containing spermicides that are inserted into the vagina before intercourse.

Advances in medical knowledge led to the development in the 1960s of the IUD (or intrauterine device), is a small T-shaped piece of plastic that has wires hanging from the tail of the T,(common name copper -T) which is placed in the uterus to prevent or interrupt the process of conception. Birth control pills, also called oral contraceptives contain hormones like estrogen and progesterone that are released into a woman's system on a regular basis (some are taken 21 days per month, others are taken every day) to prevent pregnancy. Different pills act in different ways: some inhibit ovulation (the release of an egg from the ovary), some prevent implantationof a fertilized egg (thereby denying cells the nourishment they need to develop into an embryo), and some thicken the secretions throughout the woman's reproductive system so that her partner's sperm has less of a chance to meet her egg.

Method	Effectiveness in pregnancy prevention	Protection against STIs
Male condom	85–98%	Protects against most STIs, including HIV. Protection unproven against infections transmitted by skin-to-skin contact
Female condom	79–95%	Laboratory studies show protection against STI/HIV. More human studies needed.
Spermicides	71–85%	Possible protection against bacterial STIs, no protection against viral STIs and HIV. May increase risk of HIV infection.
Diaphragm (with spermicides)	84–94%	Possible protection against bacterial STIs. Increased risk of bacterial vaginosis. Little is known about protective effect of diaphragm against HIV. Protective against cervical neoplasia. Spermicide use may increase risk of HIV infection.
Oral contraceptives	92–>99%	No protection against lower genital tract infections; reduced risk of symptomatic PID. No protection against viral STIs and HIV. Yeast infections more common.
Implantable contraceptives	>99%	No protection against bacterial or viral STIs and HIV.
Injectable contraceptives	>99%	No protection against lower genital tract infections; reduced risk of symptomatic PID. No protection against viral STIs and HIV.
IUD	>99%	No protection against bacterial or viral STIs and HIV. Associated with PID in first month after insertion.
Surgical sterilization (tubal ligation and vasectomy)	>99%	No protection against lower genital tract infections; reduced risk of symptomatic PID. No protection against viral STIs and HIV.

Sterilization, the surgical alteration of a male or female to prevent them from bearing children, is also common form of birth control. In men, the operation is called a vasectomy. It is a simple out-patient procedure that involves snipping the vessel through which sperm passes so that semen—the off-white secretion ejected from the penis at the time of sexual climax—no longer contains sperm.

In women, sterilization involves a procedure called tubal ligation, in which the fallopian tubes that carry eggs from the ovaries to the uterus are tied or clipped. An egg that is released by an ovary during ovulation does not reach the uterus, thus preventing fertilization.

QUESTION BANK

EXERCISE - 1

LEVEL - 1

Q.1 What is the importance of DNA copying in reproduction?
Q.2 Why is variation beneficial to the species but not necessarily for the individual ?
Q.3 How does binary fission differ from multiple fission ?
Q.4 How will an organism be benefited if it reproduces through spores ?
Q.5 Why is vegetative propagation practised for growing some types of plants?
Q.6 How is the process of pollination different from fertilisation?
Q.7 What is the role of the seminal vesicles and the prostate gland ?
Q.8 What are the changes seen in girls at the time of puberty ?
Q.9 How does the embryo get nourishment inside the mother's body ?
Q.10 If a woman is using a copper-T, will it help in protecting her from sexually transmitted diseases?
Q.11 What is the adaptive advantage for deciduous trees to shed their leaves each fall ?
Q.12 How many self-pruning be related to nutrient allocation in Ponderosa pine trees ?
Q.13 What part of your own life cycle is analogous to a plant's vegetative growth phase ?
Q.14 If tubers are underground stems, what to the "eyes" of the potato represent ?
Q.15 What do you mean by reproduction ?
Q.16 What do you understand about pollen grain ?
Q.17 Write the names of any three methods of artificial vegetative reproduction.
Q.18 Give the names of different whorls of a flower.
Q.19 Explain, why the testes of man is outside from the body ?
Q.20 Name any two such animals in which external fertilization takes place.
Q.21 Name the two animals is which asexual reproduction takes place.
Q.22 Write the three parts of a sperm ?
Q.23 What is Asexual Reproduction ?
Q.24 What is Sexual Reproduction ?
Q.25 Name the two hormones which are secreted by ovaries.
Q.26 Why do mouse parents produce mouse-like offspring ? Give reasons.
Q.27 Name an organism which is reproduced by multiple fission.
Q.28 Give one example of each of the following- .
(i) Alecithal eggs, (ii) Microlecithal eggs, (iii) Mesolecithal eggs, (iv) Polylecithal eggs.
Q.29 Write the three stages of Oogenesis. .
Q.30 Name the organism that multiplies by binary-fission.
Q.31 Give one example of hermaphrodite animals.
Q.32 Which organisms are termed as monoecious ?
Q.33 How the zygote is formed ?
Q.34 What is vasectomy ?
Q.35 What is zygote ?
Q.36 How is vegetative propagation different from regeneration?
Q.37 Name the different agents of pollination.
Q.38 Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration?
Q.39 How does reproduction help in providing stability of population of species ?
Q.40 Name the parts of female reproductive system.
Q.41 How is embryo formed in human female ?

Q.42 What is the role of the seminal vesicles and the prostrate gland ?
Q.43 What is scrotum ?
Q.44 Mention any two functions of human ovary.
Q.45 Define menopause.

LEVEL-2

Q.46 Point out the difference in the male and female urethra.
Q.47 What is fertility period of males and females in human beings ?
Q.48 What is about the reproduction of certain flowering plants that allows them to live in more diverse communities, with many different plant species, than some wind-pollinated plants, which tend to live among many individuals of their own species ?
Q.49 How does habitat affect the reproduction of plants and animals ?
Q.50 How do animals reproduce ?
Q.51 Write the aims of reproduction.
Q.52 Differentiate between Asexual and Sexual Reproduction.
Q.53 Write the difference between external fertilization and internal fertilization.
Q.54 Write advantages of artificial vegetative reproduction.
Q.55 What is Gestation Period ? Explain with examples.
Q.56 Why is it considered better to grow a rose from cutting rather than from seeds ?
Q.57 Write a short note on budding in Hydra.

EXERCISE - 2

Fill in the blanks

Q.1 In many invertebrate organisms, both sexes are found in the same individual. This is called .....
Q.2 In the human sexual response cycle, the ..... phase or stage usually follows orgasm.
Q.3 The development of the ..... egg and ..... fertilization freed the animals from the aquatic environment for reproduction and development.
Q.4 During the birth process, the pituitary hormone ..... signals the uterus to contract.
Q.5 Pollen grains are formed in .....of stamen.
Q.6 Cross pollination brings about ..... recombination in new plants.
Q.7 A technique to produce genetically individuals from a single cell is known as .....
Q.8 Study of pollen grains is known as .....
Q.9 The process of asexual reproduction in amoeba is .....
Q.10 Budding is a common method of asexual reproduction in yeast and .....
Q.11 In ..... vegetative propagation occurs by leaves.
Q.12 By the fusion of male and female gametes, ... is formed.
Q.13 Eggs are produced in .....
Q.14 Release of egg from ovary is called as .....
Q.15 Surgically when fallopian tube is removed or ligated, it is called .....
Q.16 Ovulation in female human beings stops after the age of .....
Q.17 Organisms such as ..... can regenerate if they are broken into pieces.
Q.18 Fertilisation occurs in the ..... tube.

True-False Statements –

Q.19 One advantage of sexual reproduction is that it allows for genetic sameness.
Q.20 The only function of the testes is to produce sperm.
Q.21 Animal development is limited to the period prior to birth hatching.
Q.22 Fertilization is the fusion of sperm and ovum.
Q.23 Onset of menstruation is termed as menopause.
Q.24 In spirogyra, asexual reproduction takes place by fragmentation.

Q.25 Vegetative propagation by leaves occurs in sweet potato.
Q.26 Transfer of male gametes to the stigma of flower is called pollination.
Q.27 In mammals including man, fertilization takes place externally.
Q.28 The ovulation takes place 10-12 days after the start of mensuration.
Q.29 In human-beings, male can produce sperms upto the age of 45-50 years.
Q.30 Reproduction, unlike other life processes, is not essential to maintain the life of an individual organism.
Q.31 In fission, many bacteria and protozoa simply divide into two or more daughter cells.
Q.32 Sexual reproduction involves two individuals for the creation of a new individual.
Q.33 DNA copying mechanisms creates variations which are useful for ensuring the survival of the species.

EXERCISE - 3

Q.1 An example of embryonic induction would be –
(A) The transplantation of the dorsal lip of the blastopore to a different site on a salamander embryo, which results in the induction of notochord formation at that site
(B) The mesoderm inducing the formation of ectoderm
(C) The induction of the morula
(D) The closure of gill slits in a mature frog

Q.2 The anther contains –
(A) sepals. (B) ovules. (C) carpel. (D) pollen grains.

Q.3 Which of the following organisms do not depend on reproduction to exchange genetic information –
(A) animals (B) plants (C) bacteria (D) fungi

Q.4 Like animals, plants produce –
(A) many more sperm than eggs.
(B) a few more sperm than eggs.
(C) equal numbers of sperm and eggs.
(D) fewer sperm than eggs.

Q.5 Asexual reproduction produces offspring that are
(A) genetically identical to their parents.
(B) genetically identical to their siblings.
(C) none of the above
(D) both (A) and (B)

Q.6 Budding and fission are processes used by –
(A) diocious species
(B) hermaphroditic organisms
(C) organisms requiring new gene combinations for each generation
(D) asexually reproducing species

Q.7 The development of offspring from any part of body is called –
(A) asexual reproduction
(B) sexual reproduction
(C) vegetative reproduction
(D) all the above

Q.8 The process of development of organism like itself is called–
(A) budding (B) flowering (C) reproduction (D) none of the above

Q.9 Which of the following is not a vegetative reproductive organ –
(A) root (B) stem (C) leaf (D) seed

Q.10 The vegetative reproduction in sweet potato is done by –
(A) stem (B) leaf (C) root (D) flower

Q.11 The reproduction in Rhizopus takes place by –
(A) budding (B) leaf (C) spores (D) cutting

Q.12 The migration of pollen grains to stigma is called as –
(A) fertilization (B) pollination (C) fusion (D) reproduction

Q.13 By which method, asexual reproduction occurs in Amoeba–
(A) fission (B) budding (C) germination (D) all of these

Q.14 Male reproductive hormone is –
(A) progesterone (B) estrogen (C) testosterone (D) all of these

Q.15 Fertilization occurs in human beings in –
(A) uterus (B) ovary (C) oviduct (D) vagina

Q.16 If cowper's gland is removed which of the following will be affected
(A) sexual attraction (B) fertilization (C) hardness of penis (D) copulation

Q.17 Oral-contraceptives prevent the
(A) fertilization (B) ovulation (C) implantation (D) entrance of sperms in vagina

Q.18 Menstrual cycle is generally of –
(A) 21 days (B) 28 days (C) 38 days (D) 40 days

Q.19 Tunica albuginea is the covering around
(A) ovary (B) testis (C) kidney (D) heart

Q.20 Seminiferous tubules are composed of –
(A) Spermatogonia (B) Glandulareplthelium
(C) Sensory epithelium (D) Germinal epithelium

Q.21 Penis is covered by sensitive skin called as –
(A) Aeromembrane (B) Prepuce (C) Metrium (D) None of these

Q.22 In mammals the testes lies in scrotal sacs due to –
(A) presence of urinary bladder (B) presence of rectum (C) long vas-deferens
(D) requirement of low temperature for spermatogenesis

Q.23 Site of fertilization in mammals is
(A) ovary (B) uterus (C) vagina (D) fallopian tube

Q.24 Cowper's glands are found in –
(A) male mammals (B) female mammals (C) male amphibians (D) female amphibians

Q.25 Acrosome is made up of –
(A) mitochondria (B) centrioles (C) golgi bodies (D) ribosomes

Q.26 Progesterone is secreted by
(A) corpus luteum (B) thyroid (C) thymus (D) testis

Q.27 The General Method of Asexual reproduction, in yeast fungus is –
(A) by spores (B) by budding (C) binary fission (D) gemma

Q.28 Fertilization takes place –
(A) in oviduct (B) in uterus (C) in ovary (D) in vagina

Q.29 Example of Exteternal fertilization is –
(A) fish and frog (B) frog and monkey (C) dog and goat (D) goat and fish

Q.30 Examples of vegetative reproduction in plants are –
(A) tomato, lady's-finger, onion, cauliflower (B) potato, ginger, onion, sugarcane
(C) cauliflower, onion, potato, tomato (D) lady's-finger, onion, ginger, sugarcane

Q.31 Development of embryo in human body takes place in-
(A) ovary (B) oviduct (C) uterus (D) ostium

Q.32 A married young man of 25 years is not having a child. The possible reason for this is –
(A) inactiveness of testosterone (B) inactiveness of progesterone
(C) activeness of progesterone (D) activeness of pituitary gland

Q.33 If there is no formation of egg cell during the development of ovule, then after fertilization which of the following structure will not develop –
(A) embryo (B) endosperm (C) seed (D) fruit

Q.34 In yeast, a sexual reproduction takes place by –
(A) spores (B) fission (C) budding (D) none of these

Q.35 Gestation period in rat is about –
(A) 640 days (B) 280 days (C) 20 days (D) 120 days

Q.36 If a starfish is cut into pieces, each piece grow into a complete animal. The process is called –
(A) regeneration (B) reproduction (C) healing of wounds (D) growth

Q.37 Reproduction in man is only-
(A) asexual (B) sexual (C) vegetative (D) parthenogenetic

Q.38 Ovaries produce –
(A) oestrogen and Progesterone (B) oestrogen only
(C) progesterone only (D) testosterone

Q.39 Fusion of male and female gametes is termed as –
(A) Reproduction (B) Vegetative propagation
(C) Cell-division (D) Respiration

Q.40 Asexual reproduction by fragmentation takes place in –
(A) Amoeba (B) Yeast (C) Spirogyra (D) Moss

Q.41 Asexual reproduction by budding takes place in –
(A) Amoeba (B) Yeast (C) Spirogyra (D) Moss

Q.42 In hydra asexual reproduction takes place by –
(A) Fragmentation (B) Budding (C) Binary fission (D) Spore-formation

Q.43 Vegetative propagation is possible by –
(A) Root (B) Stem (C) Leaves (D) All the above

Q.44 Vegetative propagation takes place by leaves in –
(A) Mint (B) Potato (C) Bryophyllum (D) All the above

Q.45 Plants of desired qualities are produced by –
(A) Cutting (B) Grafting (C) Layering (D) Any one of (A), (B),(C)

Q.46 In sweet potato vegetative propagation takes place by –
(A) Root (B) Stem (C) Leaves (D) All the above

Q.47 Pollen grains are produced by –
(A) Corolla (B) Anther (C) Ovary (D) Ovule

Q.48 Asexual reproduction takes place through budding in
(A) amoeba. (B) yeast. (C) plasmodium. (D) leishmania.

Q.49 Which of the following is not a part of the female reproductive system in human beings –
(A) Ovary (B) Uterus (C) Vas deferens (D) Fallopian tube

EXERCISE - 4

Match the column–

Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in **column I** have to be matched with statements (p, q, r, s) in **column II**.

Q.1 Match them correctly.

Column I	**Column II**
(A) Functional maturation of sperm	(p) Epididymis
(B) Site of spermatogenesis	(q) Seminiferous tubules
(C) Fertilized egg during implanation	(r) Blastula
(D) First haemopoitic organ	(s) Yolk sac

Q.2 Match them correctly.

Column I	**Column II**
(A) Villi of human placenta	(p) Chorionic villi
(B) Storge of sperm	(q) Vas deferens
(C) General position of foetus during parturition	(r) Occipito anterior
(D) Blood testis barrier	(s) Sertoli cells

ASSERTION & REASON TYPE

Each question contains STATEMENT-1 (Assertion) and STATEMENT-2 (Reason). Each question has 5 choices (A), (B), (C), (D) and (E) out of which ONLY ONE is correct.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is not a correct explanation for Statement-1.
(C) Statement -1 is True, Statement-2 is False.
(D) Statement -1 is False, Statement-2 is True.
(E) Statement -1 is False, Statement-2 is False.

Q.1 **Statement 1 :** During fertilization only head of spermatozoa enters egg.
Statement 2 : If several spermatozoa hit the egg at same time, all can enter the egg.

Q.2 **Statement 1 :** Asexual reproduction is also called blastogenesis.
Statement 2 : In asexual reproduction, ther is no formation and fusion of gametes.

Q.3 **Statement 1 :** Amoeba shows multiple fission during unfavourable conditions.
Statement 2 : Chances of servival are less during unfavourable conditions.

Q.4 **Statement 1 :** Urethra in human male acts as urinogenital canal.
Statement 2 : Urethra carries only urine while sperms are carried by vasa deferntia only.

Q.5 **Statement 1 :** In human male, there are parianal glands near the anus.
Statement 2 : Perianal glandsd secretes sex-attractant pheromone which initiates sexual desire in human female.

Q.6 **Statement 1 :** Holoblastic cleavage with almost equal sized blastomeres is a characteristic of placental animals.
Statement 2 : Eggs of most mammals, including humans, are of centrolecithal type.

EXERCISE - 5

PREVIOUS YEARS COMPETITION PROBLEMS

Q.1 The asexual process replaced by the sexual method is known as –
(A) Semigany (B) Amphimixis (C) Apospory (D) Apomixis

Q.2 Gemmule formation in sponges is helpful in –
(A) Parthenogenesis (B) Sexual reproduction (C) Only dissemination (D) Asexual reproduction

Q.3 The nutritive medium for the ejaculated sperms is given by–
(A) Seminal fluid (B) Vaginal fluid (C) Uterine lining (D) Fallopian tube

Q.4 The mammalian follicle was first described by –
(A) Von Baer (B) de Graaf (C) Robert Brown (D) Spallanzil

Q.5 Ovulation in mammals is caused by –
(A) FSH and TSH (B) FSH and LH (C) FSH and LTH (D) LTH and LH

Q.6 The cyclic period of sexual activity in non-human female mammals is called –
(A) Mensuration (B) Luteinization (C) Oogenesis (D) Estrous

Q.7 If both ovaries are removed from a rat, then which hormone is decreased in blood –
(A) Oxytocin (B) Estrogen (C) Prolactin (D) Gonadotrophic

Q.8 Fertilization occurs in human, rabbit and other placental mammals in –
(A) Ovary (B) Uterus (C) Fallopian tubes (D) Vagina

Q.9 Which one of the following statements with regard to embryonic development in humans is correct –
(A) Cleavage division bring about considerable increase in the mass of protoplasm
(B) In the second cleavage division, one of the two blastomeres usually divides a little sooner than the second
(C) With more cleavage divisions, the resultant blastomeres become larger and larger
(D) Cleavage division results in a hollow ball of cells called morula

Q.10 The concept that organiser is essential for embryonic development was given by or For the 'Theory of organiser' Nobel prize was given to –
(A) J. Axelrod (B) C. Landsteiner (C) H. Spemann (D) I.P. Pavlov

Q.11 Which part of the ovary in mammals acts as an endocrine gland after ovulation –
(A) Vitelline membrane (B) Graffian follicles
(C) Stroma (D) Germinal epithelium

EXERCISE - 6

PREVIOUS YEARS BOARD QUESTIONS

Q.1 Name the type of fission carried out by Amoeba.
Q.2 Write the expanded form of AIDS.
Q.3 What is vegetative propagation ?
Q.4 List two functions performed by ovaries in a human female.
Q.5 Write the full form of IUCD.
Q.6 Name any two sexually transmitted diseases.
Q.7 Which one of the following is NOT a part of the organ-system to which the other three belong ?
(a) Seminiferous tubules (b) Fallopian tube (c) Epididymis (d) Vas Deferens
Q.8 What harm is caused if the testis in human males fail to descend into the scrotal sacs ?
Q.9 List the general characteristics of the pollen grains of wind pollinated plants.
Q.10 What is double fertilisation ?
Q.11 Why do testes in mammals descend into scrotum ?
Q.12 What methods will you use for growing jasmine and rose plant ?
Q.13 Describe how the sex of the offspring is determined in the zygote in human beings.
Q.14 Some crop plants can be grown from a seed as well as vegetatively from stem cutting. List any four advantages of vegetative propagation in such cases.
Q.15 Show by a series of labelled sketches, the manner in which reproduction occurs in Hydra.
Q.16 (a) What is fertilisation ? Distinguish between external fertilisation and internal fertilisation.
(b) What is the site of fertilisation in human beings ?
Q.17 Define the terms unisexual and bisexual giving one example of each.
Q.18 Explain double fertilisation in plants.
Q.19 (i) Which are the two main types of reproduction in living organisms ? (ii) Classify the following under these two types :Amoeba, Frog, Earthworm, Yeast.
Q.20 What is vegetative propagation ? When is it used ? Name three methods of vegetative propagation.
Q.21 Differentiate between 'self pollination' and 'cross-pollination'. Describe 'double fertilisation in plants.
Q.22 (i) When does ovulation occur during the menstrual cycle in a normal healthy female ?
(ii) Draw a labelled diagram to show the reproductive system of a human female.
Q.23 Draw a diagram of a flower to show its male and female reproductive parts. Label on it :
(a) The ovary (b) The anther (c) The filament (d) The stigma
Q.24 Draw the diagram of a flower to show its male and female reproductive parts. Label the following on it
(i) Ovary (ii) Anther (iii) Filament (iv) Stigma
What is the function of anther ? How does fusion of male and female gametes take place in plants ?
Q.25 Draw a diagram to show fertilisation in a flowering plant. Label on it :
(i) Stigma (ii) Ovary (iii) Polar nuclei (iv) Egg
Define the term 'double fertilisation in plants'. After fertilisation name the part in each case which develops into (i) the fruit (ii) the seeds.
Q.26 Give two reasons for avoiding frequent pregnancies of women. Explain the following methods of contraception giving one example of each : (i) Barrier method (ii) Chemical method(iii)Surgical method

ANSWER KEY

EXERCISE - 1

(14) Buds **(17)** (i) Cuttings, (ii) Grafting, and (iii) Layering. **(20)** (i) Frog (ii) Fishes
(21) (i) Amoeba (ii) Hydra **(22)** (i) Head (ii) Middle piece (iii) Tail
(25) (i) Estrogen, (ii) Progesterone. **(27)** Amoeba. **(30)** Amoeba
(31) Hydra and earthworm. **(32)** Unicellular organisms.

EXERCISE - 2

(1) hermaphroditism **(2)** resolution **(3)** land, internal **(4)** oxytocin
(5) Triploid **(6)** Genetic **(7)** Cloning **(8)** Palynology
(9) binary fission **(10)** hydra **(11)** bryophyllum **(12)** zygote
(13) ovary **(14)** ovulation **(15)** tubectomy **(16)** 45-50
(17) hydra **(18)** fallopian **(19)** False **(20)** False
(21) False **(22)** True **(23)** False **(24)** True
(25) False **(26)** True **(27)** False **(28)** True
(29) False **(30)** True **(31)** True **(32)** True **(33)** True

EXERCISE - 3

Q	1	2	3	4	5	6	7	8	9	10	11
A	A	D	C	A	D	D	A	C	C	C	C
Q	12	13	14	15	16	17	18	19	20	21	22
A	B	A	C	C	B	B	B	B	D	B	D
Q	23	24	25	26	27	28	29	30	31	32	33
A	D	A	C	A	B	A	A	B	C	A	A
Q	34	35	36	37	38	39	40	41	42	43	44
A	C	C	A	B	A	A	C	B	B	D	C
Q	45	46	47	48	49						
A	B	A	B	B	C						

EXERCISE - 4

(1) (A) → p (B) → q (C) → r (D) → s **(2)** (A) → p (B) → q (C) → r (D) → s
(1) (C) **(2)** (B) **(3)** (A) **(4)** (C) **(5)** (D) **(6)** (C)

EXERCISE - 5

Q	1	2	3	4	5	6	7	8	9	10	11
A	D	D	A	B	B	D	B	D	B	C	B