

# CHAPTER

# 18

## REPRODUCTION

### Reproduction:-

#### 1. Definition:

Reproduction is the mechanism that produces new generation and maintains a species.

#### 2. Types:

Reproduction is a two types, asexual reproduction and sexual reproduction.

#### (a) Asexual Reproduction:

##### Definition:

Asexual reproduction requires only a single parental organism which gives rise to offspring by mitotic cell division.

| Advantages                                                                                                                                                                                                                             | Disadvantage                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (i) During it the total, chromosomes content of the cell is exactly replicated and passed on into daughter cells.                                                                                                                      | (i) In asexual reproduction, although increase in number of genetically a like individual from a parent is very rapidly but this is not an adaptive method and may at some stage jeopardize the survival of a species. |
| (ii) The offspring are genetically identical to parent.                                                                                                                                                                                | (ii) Rapid aging and low resistance to environmental stress and diseases are still the limitation for                                                                                                                  |
| (iii) Man has favored this type reproduction for his own needs, tissue culturing in plants and cloning in animals are being done for producing organisms of valuable characteristics without a change in their generic make up method. | (iii) It is also not being accepted socially and morally in general.                                                                                                                                                   |

#### (b) Sexual Reproduction:

##### Definition:

Sexual reproduction usually involves two parent. A fertilized egg is produced through the union of the meiotically produced specialized sex cell (egg and sperm) from each parents.

##### Advantages:



- (i) Meiosis or reduction division gives rise to gametes (gametogenesis) in which chromosome number became halved (haploid). This maintain the chromosome number in a species generation after geerations.
- (ii) Reshufling of genes lead to recombination of genes producing genetic variation, an important factor in the survival and adaptation of species or a population.
- (iii) In plants, during alternation of generations (a diploid sporophyte and haploid gametophytes), meiosis occur during spore formation (sporogenesis).

### REPRODUCTIN IN PLANTS

In plants both sexual and asexual reproduction are found. In asexual reproduction layering, grafting, budding etc. are artificial modes.

In sexual reproduction, plants have **diplohaplontic life cycle** with alternating diploid **sporophyte** and **haploid gametophyte** generations. If the two generations are vegetatively similarly, such alternation of generations is refereed to as **isomorphic**, and if they are dissimilar it is called **heteromorphic**.

Seed plants are predominantly present all around us due to their better sexual reproduction mechanism like modification. flower and inflorescence for pollinations, involving gemete transfer by pollen tubes, food storage for developing embryo, protection by seed coats and dispersal with the help of fruit formation (angiosperms).

Evolution of pollen tube is and important step in land adaptation by the spermatophytes. Pollen tube acts as vehicle for male gametes for their sage transport to female gamete in ovule in hostile land environment. Evolution of pollen tube is parallel to the evolution of seed and is a tool of success for seed plants.

Seeds are capable of enduring unfavourable conditions become favourable for establishing the seedling, it germinates.



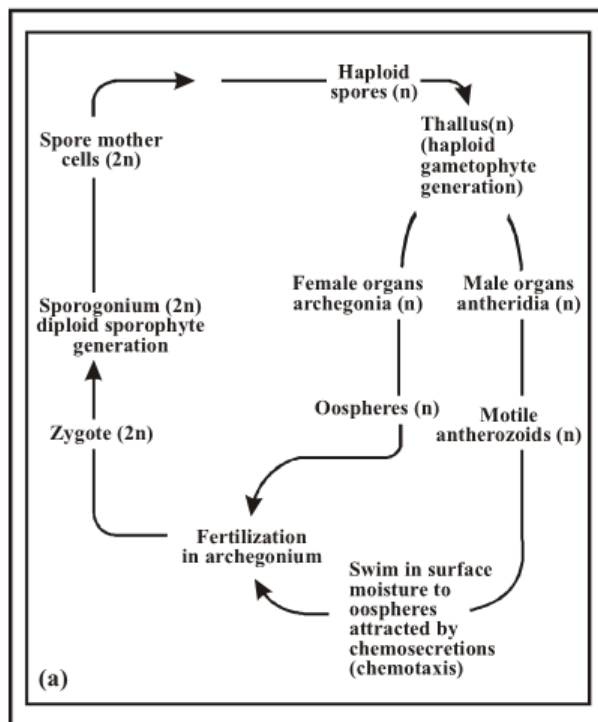


Fig. (a) Bryophyte life cycle. Note that the sporophyte is completely dependent upon the gametophyte.

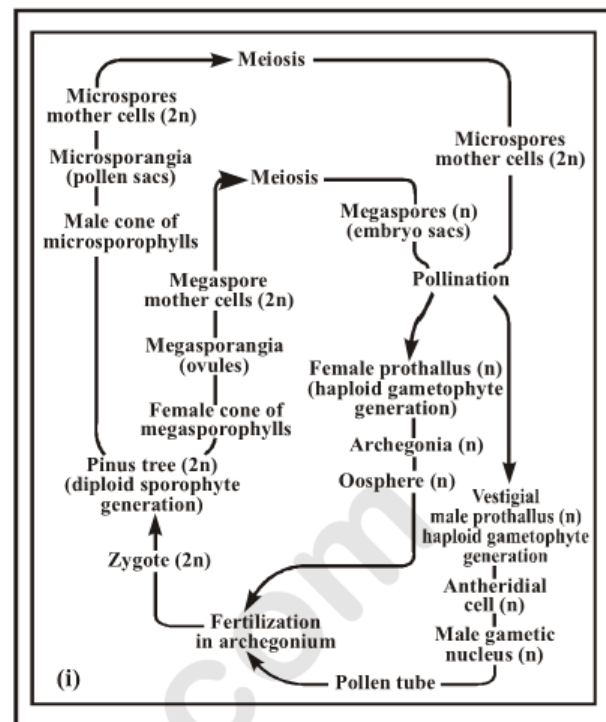


Fig. (b) Spermatophyte life cycles (i) Gymnosperm life cycle, *Pinus sylvestris* (Class Pinatae). (ii) Angiosperm life cycle.



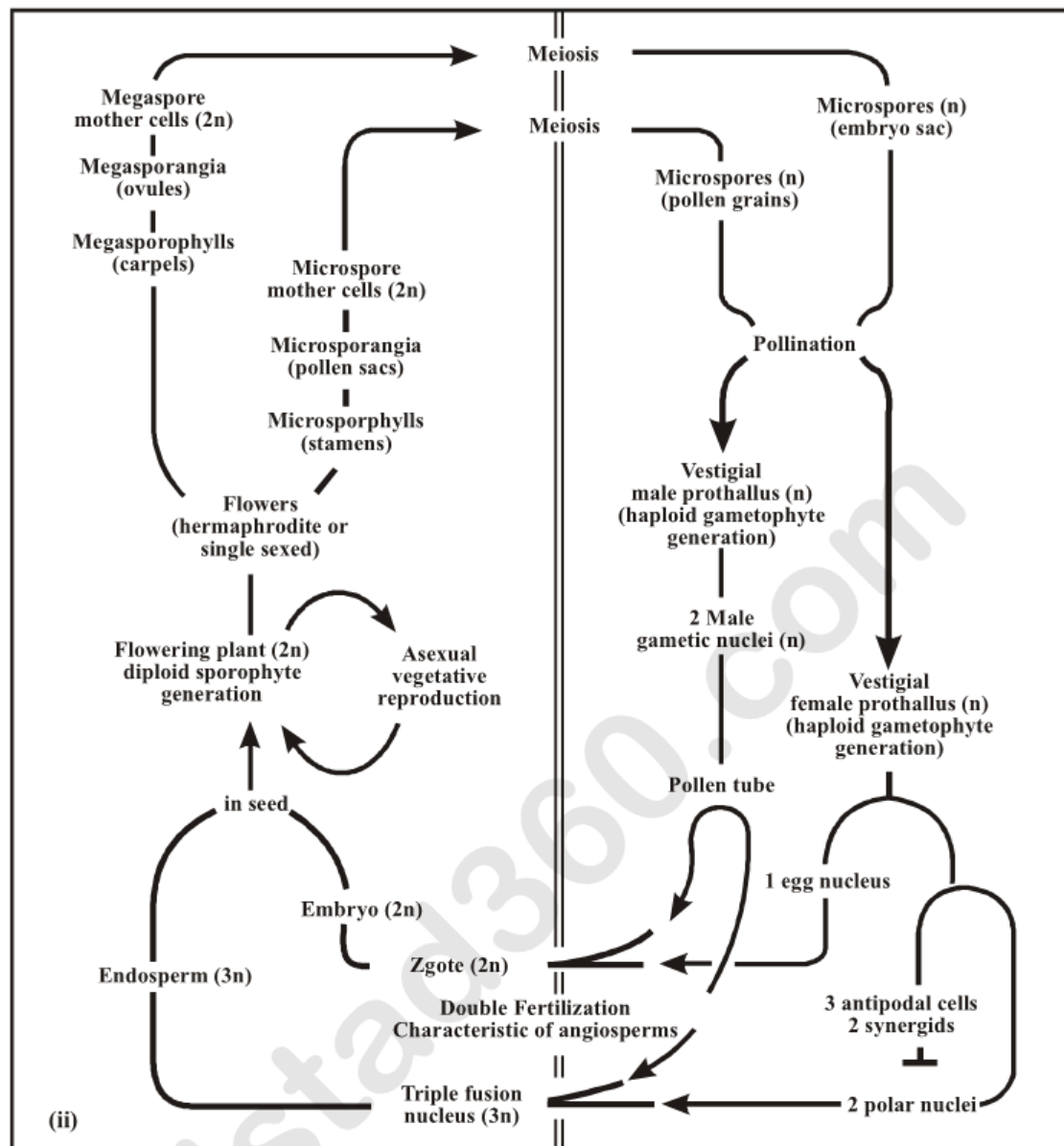


Fig. (ii) Angiosperm life cycle

**Parthenocarpy:****Definition:**

In some cases fruit development proceeds without fertilization and thus no seed formation takes place e.g. banana, pineapples and some varieties of oranges and grapes. Such development is called parthenocarpy.

**Significance****Causes:**

It is due to hormonal imbalance; usually high auxin levels occur in these ovaries. Parthenocarpy is sometime artificially induced for commercial purposes, by adding auxins as in tomato, peppers etc.



## Seed Dormancy

### Definition:

It is the special condition of rest, which enables and embryo to survive the long periods of unfavorable environmental conditions, such as water scarcity or low temperature.

### Significance

During this period of rest the embryo ceases its growth.

### Advantages:

This is of great survival importance to the plant in that it prevents the dormant seed from germinating in response to conditions such as a warm spell in winter, which, although apparently favorable are only temporary which may fatal later on.

## Fruit Set and Fruit Ripening

### Definition:

Retention of the ovary on the flower to become fruit later on is called fruit set.

### Mechanism:

Germinating pollen grain is not only an important structure for safe transfer of gametes but also a rich source of auxins and also stimulating tissues of the style and ovary to produce more auxin. This auxin is necessary for the retention of the ovary, (fruit set) which becomes the fruit after fertilization. Without it, abscission of flowers normally occurs, leading to low fruit yields.

### Fruit ripening:

After fertilization, the ovary and the ripe seeds continue to produce auxins which stimulate fruit development. Developing seeds are not only a rich source of auxins and gibberellins, but also of cytokinins. These growth substances are mainly associated with development of the embryo and accumulation of food reserves in the seed and sometimes in the pericarp (fruit wall).

### Climacteric:

Fruit ripening is often accompanied by a burst of respiratory activity called the climacteric. This is associated with ethane production, which helps in ripening of the fruit.

## PHOTOPERIODISM

### (i) Photoperiod:

Light not only affects photosynthesis and phototropic responses, but also variations in day length (called photoperiod) affect flowering, fruit and seed production, bud and seed dormancy, leaf fall and germination.

### (ii) Definition:

Photoperiodism is a phenomenon of study of photoperiod and its effects on flowering. During it shoot meristems start producing floral buds instead of leaves and lateral buds.



**(iii) Discovery:**

Effect of photoperiodism was first studied in 1920, by Garner and Allard. They studied that tobacco plant flowers only after exposure to a series of short days. Tobacco plant naturally flowers under same condition, in autumn, but flowering could be induced by conditions artificially to short days exposing.

**(iv) Light based classification:**

They classify flowering plants into long-day plants, which require long days for flowering, short day plants which require short days for flowering and day neutral plants which flower without being influenced by photoperiod.

**(v) Importance of dark period:**

Later on, further studies indicated that it is really the length of the dark period which is critical. Thus short-day plants are really long-night plants. If they are grown in short days, but the long night is interrupted by a short light period, flowering is prevented. Long-day plants will flower in short days if the long night period is interrupted.

**Classification of plants according to photoperiodic requirements for flowering**

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

**Some Phytochrome-Controlled Responses in Plants**

| <b>General process effected</b>                                         | <b>Red light promotes</b>                                                      |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Germination                                                             | Germination of some seeds, e.g. some lettuce varieties                         |
| Photomorphogenesis (light-controlled development of form and structure. | Germination of fern spore                                                      |
|                                                                         | Leaf expansion in dicotyledons. Leaf unrolling in grasses (monocotyledons).    |
|                                                                         | Chloroplast development etiolation.                                            |
|                                                                         | Greening (protochlorophyll converted to chlorophyll). Inhibition of internodes |



|                |                                                                                                                                                                                                                             |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Phytoperiodism | growth (including epicotyl, hypocotyls and mesocotyl), i.e. preventing of etiolation. Unhooking of plumule in dicotyledons. Stimulates flowering in long-day plants. Inhibits flowering in short-day plants. See flowering. |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**(vi) Importance of quality of Light:**

Further experimentation also revealed that quantity of light is also influenced by the quality of light. Cocklebur, a short day plant, will not flower if its long night is interrupted but experiments revealed that red light was effective in preventing flowering and far-red light reversed the effect of red light. It was also demonstrated that the last light treatment always determines the response.

**(vii) Discovery of phytochromes:**

During photoperiodism the affect of light intensity and quality upon flowering led to the discovery of blue light sensitive protein pigments, the phytochromes.

Phytochrome exists in two forms i.e. P 660 and P730. P 660 a quiescent (inactive) form absorbs red light at a wave length of 660 nm and is converted to active P 730. P730 absorbs far red light at 730 nm and is converted to P660.

**(viii) Interconversion of phytochrome and detection of light period:**

In nature, the P 660 to P730 conversion takes place in day light and P 730 to P660 conversions occur in the dark. Thus during the day a plant has P730 phytochrome while during the night it contains more phytochromes in the form of P660. The presence of either form provides the plants with a means of detecting whether it is in a light or dark environment. The rate at which P 730 is converted to P 660 provides the plants with a "clock" for measuring the duration of darkness.

**(ix) P730–P660 interconversion hypothesis about plant time–regulator for flowering:**

It has been found that red light inhibits flowering in short day plants but promotes flowering in long day plants, under conditions during which flowering normally takes place. This observation led to hypothesize that the P730-P660 interconversion might be the plant time, regulator for flowering. According to this hypothesis, P 730, converted from P 660 by the absorption of red light, would inhibit flowering in short day plants but promote flowering in long day plants. Because P730 accumulates in the day and diminishes at night, short day plants could flower only if the night were long enough, during which a great amount of P730 would not be completely inactivated, so that enough P 730 would remain at the end of the night to promote flowering.

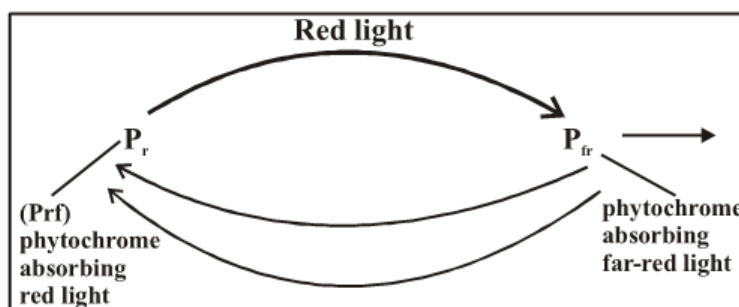
**(x) Importance of light/darkness:**

But now it is generally agreed that the time measuring phenomenon of flowering is not totally controlled by the interconversion of P 660 to P 730. Other factors,



like presence or absence of light length of dark, or light period also play an important role in flowering.

phytochromes seems to be responsible for the detection of either light of darkness.



#### (xi) **Florigen and its role:**

The biological clock once stimulated causes production of florigen hormone in leaves, which travels through phloem to be floral buds, initiating flowering.

### **VERNALIZATION**

#### (i) **Definition:**

Biennials and perennial plant are stimulated to flower by exposure to low temperature. This is called vernalization. The low temperature stimulus is received by the shoot apex of a mature stem or embryo of the seed but not by the leaves as in photoperiodism.

#### (ii) **Vernalin and its role:**

Low temperature stimulates the production of “vernalin” hormone which induces vernalization. It is now believed that vernalin actually is gibberellins.

#### (iii) **Importance:**

For some plants, vernalization is an absolute requirement or in some cases it simply assists in inducing flowering. The duration of low temperature (chilling) treatment required varies from four days to three months. Temperature around 4°C is found to be very effective photoperiodism and vernalization serve to synchronize the reproduction behaviour of plants with their environment, enduring reproduction at favourable time of year. They also ensure that members of the same species flower at the same time, encouraging cross pollination for genetic variability.

## **REPRODUCTION IN ANIMALS**

### **Asexual reproduction parthenogenesis**

#### (i) **Definition:**

Parthenogenesis is defined as the formation of zygote without fertilization.

#### (ii) **Haploid Parthenogenesis:**

It occurs in ants, bees and wasps. In the honeybees, males develop from fertilized eggs. The queen bee, though carrying male gametes from male has the ability to lay eggs that have not been fertilized.

In honey bee male are haploid and produce sperms by mitosis.

The sperms she receives from a drone bee are stored in a pouch closed off by a valve. The eggs may be fertilized or may not be fertilized from the stored sperms. The haploid egg develop into haploid offspring, it is call **haploid parthenogenesis**.



**(iii) Diploid Parthenogenesis:**

In some cases e.g. in aphids, diploid parthenogenesis may occur, in which egg producing cell of the female undergo a modified form of meiosis involving total non-disjunction of the chromosome. Egg (diploid) develops into young females.

Parthenogenesis has advantage of accelerating the normal reproductive rate.

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

**Tissue Culturing and Cloning:**

**Tissue culture definition:** In tissue culturing technique in plants, cambium tissue excised from plants can be stimulated by the addition of nutrients,

Cytokinins, and IAA “indole acetic acid”.

These cells show continued growth and differentiate into a new plant, genetically identical to their parents. Tissue culture is now widely used for the rapid propagation of desired varieties or for varieties difficult to propagate by cuttings.

**Cloning in animals:**

Organisms produced from a single cell by subculturing are called clone. In animals and especially among vertebrates, a nucleus from the somatic cell is removed and introduced into an egg cell, whose own nucleus has been destroyed by ultraviolet radiations. The egg with transplanted diploid somatic cell nucleus develop into an organism, genetically identical to the parent who has contributed the nucleus.

**Advantages of cloning:**

The cloning desirable such as prize bulls, race horses etc, might be as useful as cloning of useful varieties of plants.

The use of cloned cells allows the quantitative study of the action of hormones, drugs and antibodies to be made on cells. Such a technique is a useful subtitle for investigating the effect of drug, cosmetics and pharmaceutical product on animal cell without exposing laboratory animals to these chemicals.

**Disadvantages:**

Cloning has advantage that all the offspring behave similarly, but should an environmental hazard develop, non resistant strains are present to lessen the impact. Also the degree to which environment influences clone develop is not fully known and any cloned cell would have to go through all the phases of development once again including embryo, fetus, baby and child hood.

**Identical twins:**

In higher vertebrates including man, zygote after fertilization, undergoes cleavage. When embryo is at two celled stage, the two blastomeres, instead of remaining



together, may separate and behave as two independent zygotes, each giving rise to a new individual. Both the organisms are product of mitosis, thus they have identical genetic make up and are called **identical twins**. They are produced mitotically.

In some cases, more than one egg is produced by the female and all these eggs are independently fertilized forming two or more zygotes. These zygotes develop into new offspring, but with different genetic combinations. Such a twins or triplets are called **fraternal twins** or **triplets**. They are produced sexually.

### **Sexual Reproduction:**

#### **(i) Definition:**

It is thought that asexual reproduction is a primitive form of reproduction than the sexual reproduction. At a later stage, a mechanism has evolved leading to production and union of gametes. Meiosis and genetic recombination played a major role in the development of more complex form of life and types of gametes from identical gametes to the heterogametic stage of motile male non motile female gametes eggs. Sexual reproduction has advantage over asexual reproduction.

| <b>Asexual reproduction</b>                                                                                                                                                                                                                                                                                                                                                           | <b>Sexual reproduction (omitting bacteria)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• One parent only</li> <li>• No gametes are produced.</li> <li>• Meiosis absent.</li> <li>• Offspring identical to parent.</li> <li>• Commonly occurs in plants, less differentiated animals and micro-organisms absent in more differentiated animals.</li> <li>• Often results in rapid production of large numbers of offspring.</li> </ul> | <p>Usually two parents</p> <p>Gametes are produced. These are haploid and nuclei of two gametes fuse (fertilization) to form a diploid zygote.</p> <p>Meiosis is present at some stage in life cycle to prevent chromosome doubling in every generation.</p> <p>Offspring are not identical to parents.</p> <p>They show genetic variation as a result of genetic recombination.</p> <p>Occurs in the majority of plant and animal species.</p> <p>Less rapid increases in number.</p> |

#### **(ii) Differentiation of Sexes A(male and female):**

Both in animals and plants, evolution of sexual reproduction also lead to the differentiation of sexes (male and female). Organisms are either having one sex (unisexual) or both sexes (hermaphrodite or bisexual). Advance mode of sexual reproduction has unisexuality in animals but in plants bisexuality in general is retained. Despite the bisexuality (tape worm, earth worm etc), cross fertilization ensured for maintaining the advantage of genetic recombination.



**Fertilization:**

Fertilization is the process which leads to the union of gametes. Fertilization may occur outside the body (external fertilization) or inside the body of female (internal fertilization).

External fertilization occurs in aquatic environment where gametes can swim towards the female gametes in water medium. Development is also external due to the constant/stable condition of water.

**Oviparous:****Definition:**

In terrestrial condition fertilization is internal. Sperms are lodged into female body where fertilization occurs. This may lead to external development in reptile and birds. They lay shelled eggs to protect the developing embryo from harsh terrestrial condition. Such animals are called oviparous.

**Examples:** 1. Hen 2. Duck

**Viviparous:**

**Definition:** In mammals, internal fertilization leads to internal development and development of embryo is accomplished inside the female body. Which gives birth to young one such animals are called viviparous.

**Examples:** 1. Humans 2. Sheep & Goat

**Ovoviviparous:****Definition:**

In some mammals like duckbill platypus and spiny ant eater internal fertilization leads to internal development of young one in a shelled egg and when development is completed shelled egg is laid which hatches to off spring. This is called ovoviviparous condition.

**Examples:** 1. Duck bill platypus 2. Spiny ant eater

Viviparous and ovoviviparous animals provide more protection to their young one during development. Nourishment is provided through stored food in the egg or through placenta by the mother.

**REPRODUCTION IN MAN**

Male and female have separate reproductive systems.



**(a) Male Reproductive System:****(i) Structure:**

Male reproduction system consist of external ganitalia which consist of pair of **testes** which lie outside the body in the sac like **scrotum** and male copulatory organ which is used to transfer the sperms into female reproductive tract.

**(ii) Spermatogenesis:**

Each testis consist of a highly complex duct system called seminiferous

tubules, in which repeated division by thee cell of germinal epithelium produce spermatogonia. These increase in size and differentiate into primary spermatocytes which undergo meiotic division to form secondary spermatocyte into mature sperms.

**(iii) Passage of Sperm:**

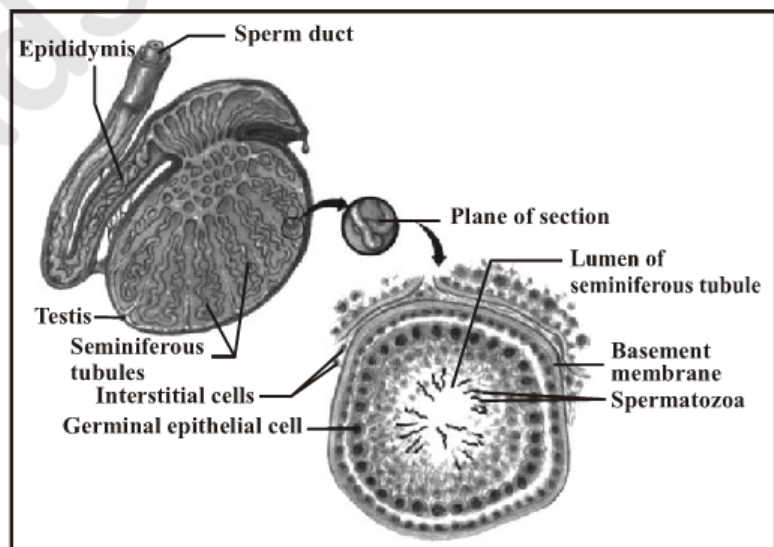
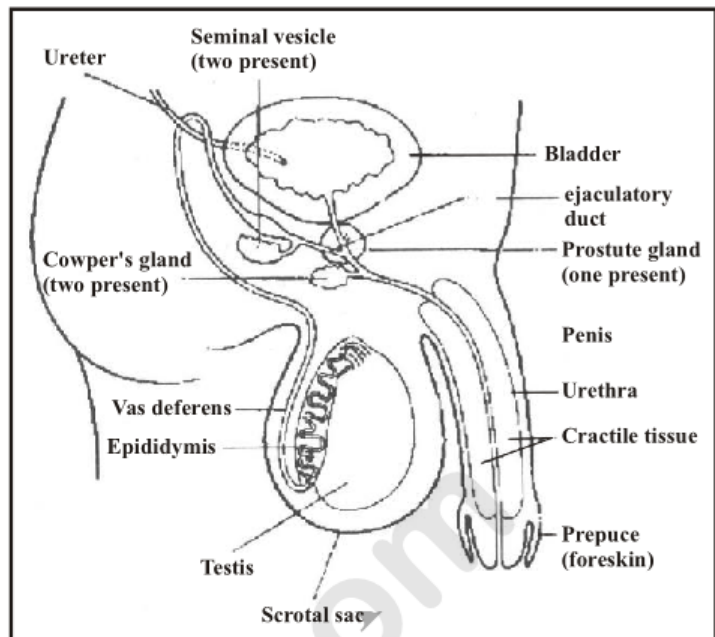
The sperms are than transferred to main duct of male reproductive tract, the vas deferens, which forms highly convoluted epididymis.

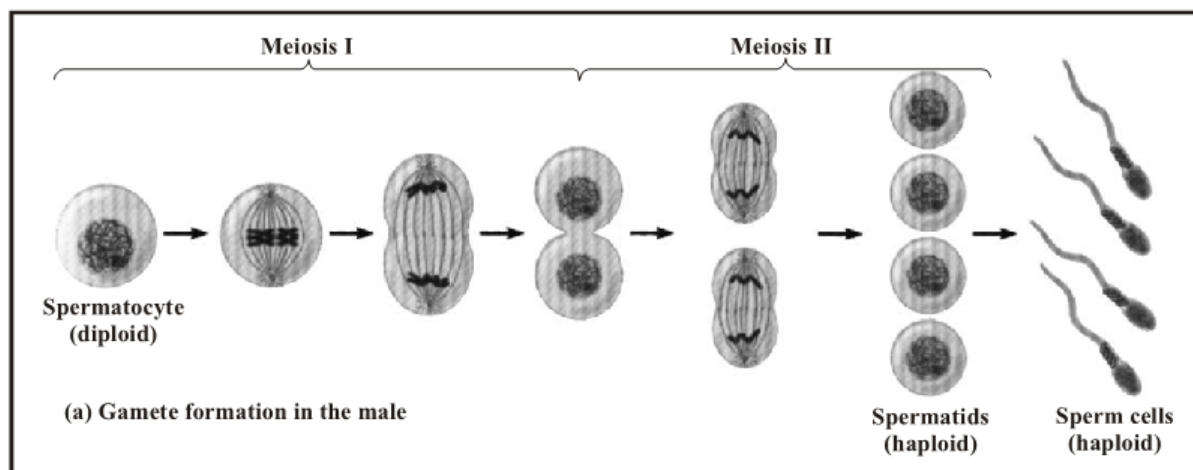
**(iv) Role of Sertoli Cells:**

Fluid secreted by sertoli cells provides liquid medium protection and nourishment to sperms while they are in tubules.

**(v) Role of testosterone:**

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





*Gamete formation*

**(b) Female Reproduction System:**

**(i) Structure:**

The female reproductive system consists of the ovaries, the oviducts, uterus and the external genitalia. A pair of ovaries lies within the body cavity of female.

**(ii) Oogenesis:**

Germ cells in the ovary produce many oogonia which divide mitotically to form primary oocytes. These are enclosed into groups of follicle cells. The primary oocyte divides meiotically into the haploid secondary oocytes and first polar body. Second meiotic division in the oocytes proceeds as far as metaphase but is not completed until the oocyte is fertilized by the sperm.

**Ovulation:**

In human only one ovum, is usually discharged from the ovary at one time. This phenomenon is called ovulation.

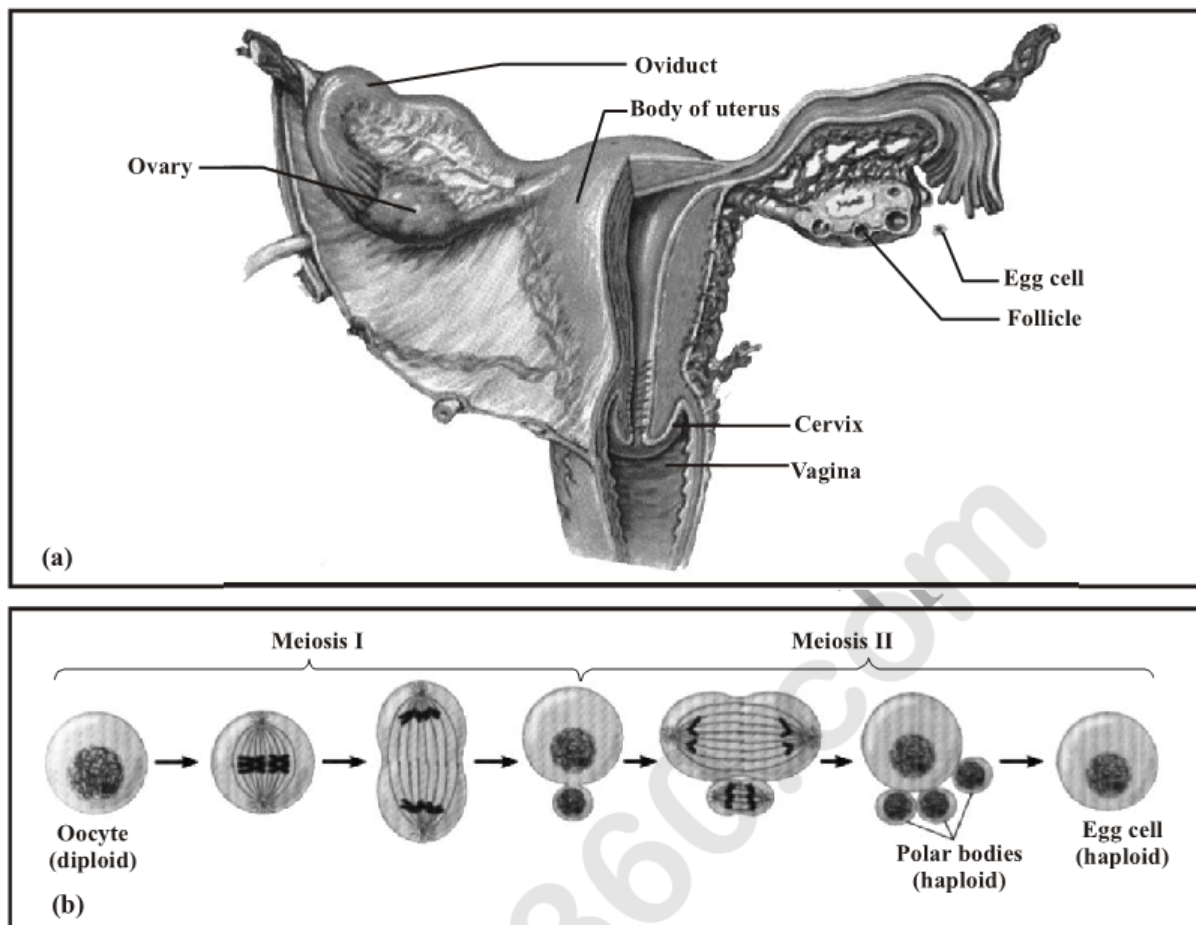
**(iv) Fertilization:**

The ovum is then transferred to the oviduct generally called fallopian tube or uterine tube. The uterine tube opens into uterus. The fertilization of the ovum takes place in the proximal part of oviduct. The fertilized ovum (zygote) enters the uterus where it is implanted and undergoes further development. Uterus opens into vagina through cervix. Urethra and vagina have independent opening to exterior.

**(v) Placenta and its role:**

A placenta is established between the uterine and foetal tissues for the exchange of oxygen, carbon dioxide, waste, nutrients and other materials.





(a) The human female reproduction system (b) gamete formation.

### Female Reproductive Cycle:

#### (i) Introduction:

In females the production of egg is a cyclic activity as compared to males, in whom gamete production and release is a continuous process beginning at puberty and lasting throughout life.

#### (ii) Menstrual cycle:

In human females the periodic reproductive cycle is completed in approximately 28 days involves changes in structure and function of whole reproductive system.

It is called menstrual cycle and can be divided into four phases. The events of menstrual cycle involve the ovaries (ovarian cycle) and the uterus (uterine cycle) and these are regulated by pituitary gonadotropins.

#### (iii) Steps in female reproductive cycle are:

##### (a) FSH and Follicle Development

The pituitary gland on the onset of

Oestrous cycle is a reproductive cycle found in all female mammals except human being. In this cycle, the estrogen production prepares the uterus for conception partly and also follicle develops ova. At this stage, female need a physical stimulus of mating for ovulation. She exhibits the desire for mating or is said to be on "heat".



puberty, releases follicle stimulating of several primary while the rest break down by degenerative process called follicle atresia.

**(b) Estrogen and its role:**

the ovary, under the stimulus of (FSH) also produces estrogen hormone. This on one hand, stimulates the endometrium (internal living of uterus wall) and vascularized it and on other hand, inhibits the secretion FSH from pituitary gland.

**(c) Secretion of Luteinizing Hormone and Ovulation:**

Decrease of FSH and increase of estrogen causes the pituitary gland to secrete luteinizing hormone LH which induces ovulation the release of ovum from the follicle.

**(d) Corpus Luteum and Progesterone Secretion:**

The follicle cells, after release of the egg. Are modified to form a special structure starts secreting hormone called progesterone. This involves develops the endometrium and make it receptive for the implantation of the zygote.

**(e) Menstruation and its steps:**

If fertilization does not occurs, the corpus luteum start degenerating. the progesterone secretion diminishes and its supporting effect on the spongy endometrium is reduced, which suffers breakdown. This causes the discharge of blood and cell debris known as menstruation. This stage usually lasts for 3-7 days.

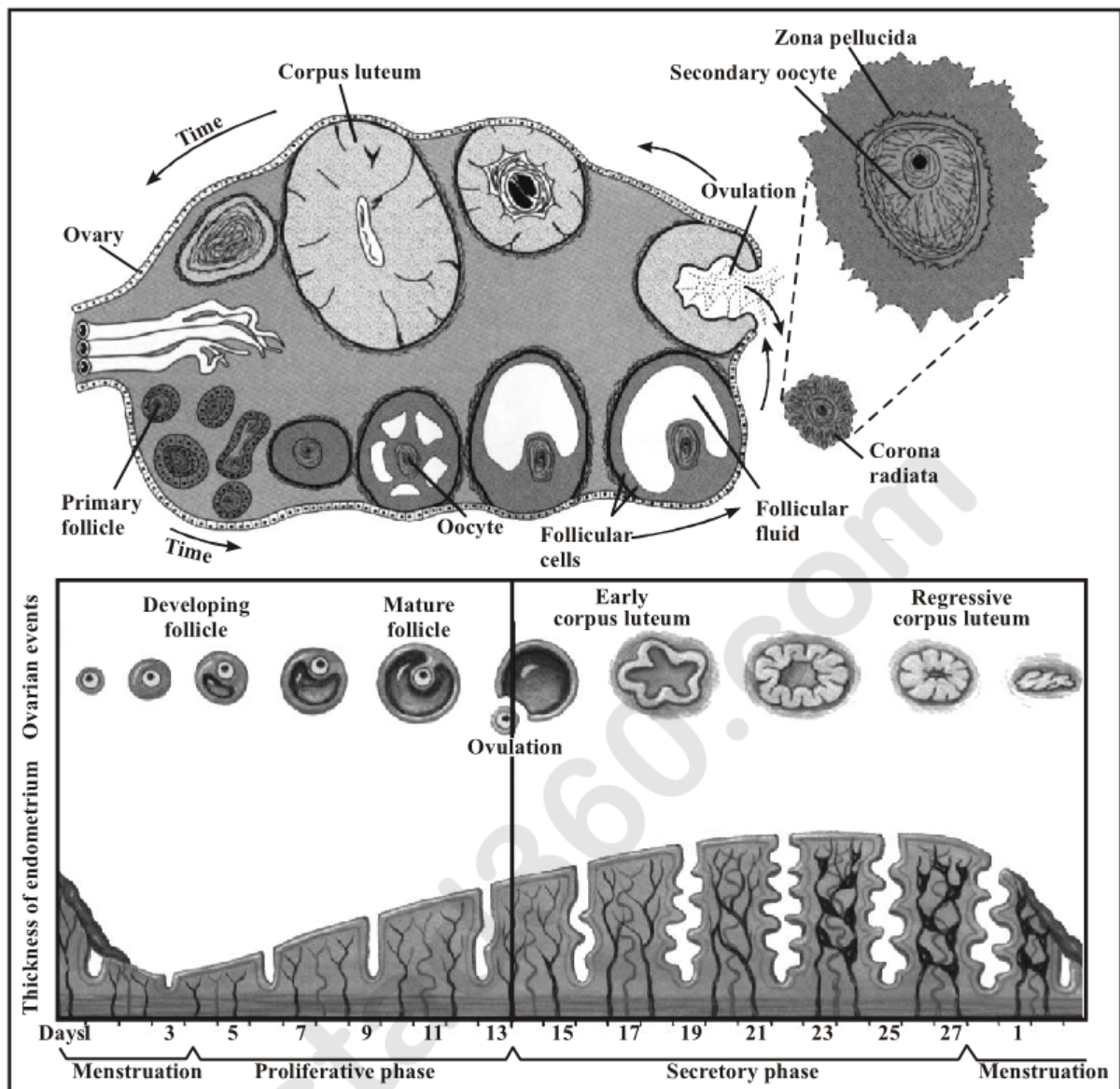
**(iv) Menopause:**

The cycle is thus completed and the uterus is ready to enter into next cycle. The human menstrual cycle generally repeats every 28 days although there is considerable variations indifferent individuals or even within the same individual at different times of her age. The end or complete stop menstrual cycle called **menopause**, after which the female stops producing the ova.

Malnourishment and emotional stresses effect female reproductive cycle.

Which may be disturbed. This cycle is not completed in its normal 28 days.





*The ovarian and uterine cycles in human female. The release of a secondary oocyte (ovulation) is timed to coincide with the thickening of the lining of the uterus. The uterine cycle in humans involves the preparation of the uterine wall to receive the embryo if fertilization occurs. Knowing how these two cycles compare, it is possible to determine when pregnancy is most likely to occur.*

## BIRTH

the total gestation period (pregnancy) is usually about 280 days.

### (i) Placenta and its Role:

Once the placenta is established it start secreting a the progesterone hormone which maintains the pregnancy. Any disturbance in its secretion may lead to premature birth or miscarriage.



**(ii) Amniotic Sac and its Role:**

Human embryo remains enclosed in amniotic sac filled with amniotic fluid which is protective and shock absorptive.

**(iii) Lactation:**

During this period pituitary gland produces luteotropic hormone (LTH). Placenta also secrete human placental lactogen. Both these hormone stimulate mammary development in preparation for lactation.

**(iv) Fetus Formation and Organogenesis:**

From the beginning of 3<sup>rd</sup> month of pregnancy the human embryo is referred to as the fetus. Most of the major organs are formed by the 12<sup>th</sup> week of pregnancy and the remainder of gestation period is taken up by growth.

**(v) Steps of Birth:****(a) Mother-fetus interaction and Timing of Birth / Maternal Factor:**

It was thought that hormonal activities within the mother i.e. decrease in progesterone level onset the birth. But recent evidence suggest that there is high degree of fetal involvement in timing of birth.

**(b) Role of Fetus pituitary and release of ACTH / Fetal Factor:**

The initial stage of birth is the result of the stimuli from fetal pituitary. The ACTH released from fetal pituitary stimulates the fetal adrenal gland to release corticosteroids.

**(c) Release of corticosteroids and production of Oxytocin:**

Corticosteroids cross the placental barrier and enter the maternal blood circulation causing a decrease in progesterone production. The reduction of progesterone level stimulates the pituitary gland to produce oxytocin hormone. This induces labour pains.

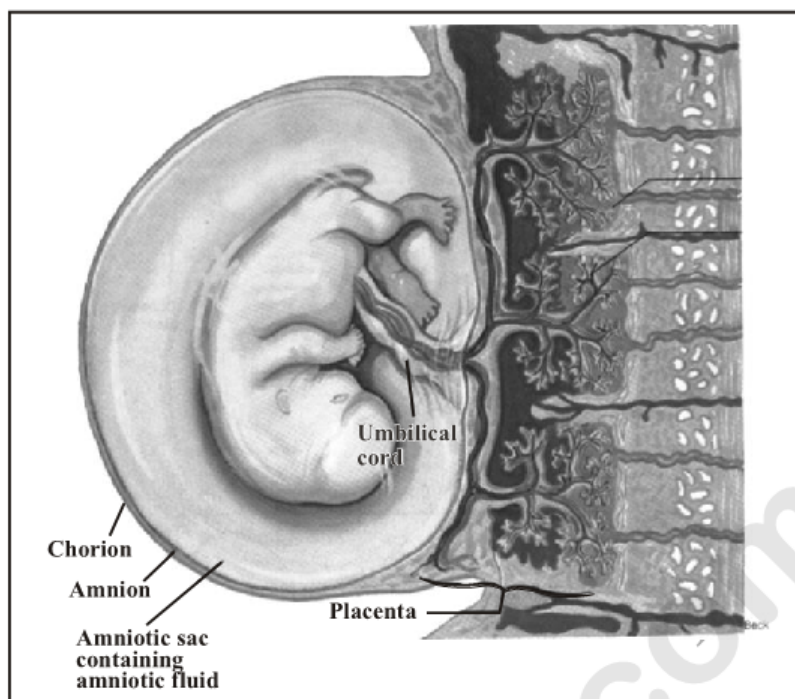
**(d) Steps of Labour:**

Contraction of uterus wall. the release of oxytocin occurs in waves during labour and provided the force to expel fetus from uterus. The cervix dilates and uterine constrictions spread down over the uterus and are strongest from top to bottom. Thus pushing the baby downward leading to delivery of baby. The umbilical cord is ligated and baby is released from the mother.

**(vi) After Birth:**

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





### Placental Structure

*The embryonic blood vessels that supply the developing child with nutrients and remove of the mother. Because of this separation, the placenta can selectively filter many type os incoming materials and microorganisms.*

### TEST TUBE BABIES

Recent bio technical advantages has led to many improvements in human life. Once of the important is the rest tube babies. Parents which are unable to enjoy the normal process of fertilization and birth of their offspring due to some physiological and physical abnormalities in any of two parents are being benefited with this method.

Parental sperm and ovum is fertilized in vitro – outside the female body and then the zygote is implanted back into the mother uterus, placenta establishes and remaining development takes place in the body of mother leading to normal birth.

### SEXUALLY TRANSMITTED DISEASE (STD)

Unhealthy attitude and low moral values sometimes lead to serious complication. the carrier may transmit this disease to their healthy partners.

#### (i) Gonorrhea:

It is caused by gram positive bacterium **Neisseria gonorrhea** manly effected the mucous membrane of urinogenital tract. New born infants may acquire serious eye infection if they passed through the infected birth canal. It is highly contagious through sexual contact.



**(ii) SYPHILLS:**

It is caused by spirilla, **Treponema Pallidum**. It damages the reproductive organs, eyes, bones, joints, central nervous system, heart and skin. Sexual contact is a major source of its dissemination.

**(iii) GENITAL HERPES:**

It is caused by **herpes simplex type 2 virus** most frequently transmitted by sexual contact causing infection of genitalia. It produces genital soreness and ulcers in the infected areas. In infected pregnant women, virus can be transmitted during birth causing damage to eyes and CNS of the infant.

**AIDS (Acquired Immune Deficiency Syndrome)**

Sexual contact is one of the major sources.

**Control:**

The above dreadful sexual disease can be controlled and prevented by avoiding sexual contact with carrier or diseased persons, adopting hygienic conditions. The treatment involves medication for a long period except AIDS at present.



## EXERCISE

### **Q.1 Fill in the blanks:**

- (i) Asexual reproduction requires only a single \_\_\_\_\_ organism.
- (ii) Sexual reproduction usually involves \_\_\_\_\_ parents.
- (iii) Phytochromes are the special \_\_\_\_\_ sensitive pigments.
- (iv) External fertilization occurs in \_\_\_\_\_ environment.
- (v) \_\_\_\_\_ and \_\_\_\_\_ animals provide more protection to their young during development.
- (vi) A placenta is established between the uterine and \_\_\_\_\_ tissues for the exchange of oxygen.
- (vii) The reduction of progesterone level, stimulates level, stimulates the \_\_\_\_\_ gland to produce oxytocin hormone.

### ANSWERS

- |                               |              |
|-------------------------------|--------------|
| (i) Parental                  | (ii) Two     |
| (iii) Light                   | (iv) Aquatic |
| (v) Viviparous Ova Viviparous | (vi) Foetal  |
| (vii) Pituitary               |              |

**Q.2** Write whether the statement is true or false and write the correct statement if false.

- (i) Asexual reproduction involves mitotic cells division.
- (ii) Asexually produced offspring are genetically identical to their parents.
- (iii) Sexual reproduction involves single parent.
- (iv) Sexual produced offspring are identical to their parent.

### ANSWERS

- |          |           |             |            |
|----------|-----------|-------------|------------|
| (i) True | (ii) True | (iii) False | (iv) False |
|----------|-----------|-------------|------------|

### **Q.3 Encircle the correct answer from the multiple choices:**

- (i) Reproduction is very important to the survival of:
  - (a) Species
  - (b) Individual
  - (c) Population
  - (d) Both a and b
- (ii) In plants photoperiod and temperature affect:
  - (a) Flowering
  - (b) Buds and seed dormancy
  - (c) Fruit and seed production
  - (d) All a, b, c



- (iii) Developing seeds are rich source of:
- (a) Auxins (b) Cytokinin  
(c) Gibberellins (d) All a, b, c
- (iv) Common methods of a sexual reproduction are:
- (a) Tissue culturing (b) Identical twins  
(c) Cloning (d) All a, b, c
- (v) Photoperiod affect flowering when shoot meristem start producing:
- (a) Floral buds (b) Leaves  
(c) Lateral bud (d) b and c

### ANSWERS

|     |     |      |     |       |     |      |     |
|-----|-----|------|-----|-------|-----|------|-----|
| (i) | (a) | (ii) | (d) | (iii) | (d) | (iv) | (d) |
| (v) | (a) |      |     |       |     |      |     |

#### Q.4 Short Question.

- (i) What changes occur in ovulation and menstruation during pregnancy?

**Ans: Ovulation:**

Mature follicle ruptures at the surface of the ovary and egg is discharged. This process is known as ovulation. The egg then finds its way to the fallopian tube or oviduct. FSH (Follicle Stimulating Hormone) stimulates the growth follicle while LH (Luteinizing hormone) stimulates not only development of egg but also release of egg from the follicle.

**Menstruation:**

Menstruation, periodic vaginal discharge in humans and other mammals, consisting of blood and cells shed from the endometrium, or lining of the uterus.

If fertilization does not occur the corpus luteum starts degenerating. The progesterone secretion diminishes (reduces gradually) and its supporting effect on the spongy endometrium is reduced, which suffers a menstruation. This stage usually lasts for 3 – 7 days.

- (ii) What is the difference between oogenesis and spermatogenesis in human?

**Ans: Oogenesis** is the formation and development of ovum or egg in the ovary while spermatogenesis is the formation and development of spermatozoa in the testes.

- (iii) How is a Seed Formed?

**Ans:** See text.

- (iv) What is importance of seed in the life cycle of a plant.

**Ans:** The seed enabled plants to colonize land permanently.



**Q.5 Extensive questions:**

- (i) **What structures are associated with the human female reproductive system? What are their function?**

**Ans:** See text.

- (ii) **What are the functions of placenta during pregnancy.**

**Ans:** See text.

- (iii) **Describe human menstrual cycle?**

**Ans:** See text.

- (iv) **Write notes on the following:**

- (a) Parthenogenesis
- (b) Herpes Genitalia
- (c) Asexual reproduction
- (d) Seedless fruits or parthenocarpy

**Ans:** See text.

