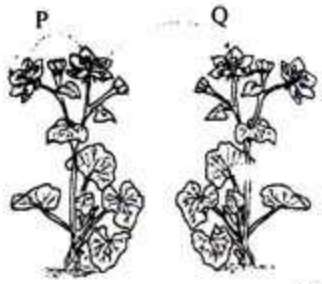
EV SSC BIOLOGY

Chapter-11: Reproduction

Ques. ▶ 1



[All Board-18]

a. What is an explant? 1
b. What is meant by organic evolution? 2
c. Describe the stages of the development of the floral component that is transfered from flower to flower by the process 'Q'. 3
d. Explain the importance of 'P' and 'Q' processes in nature. 4

Answer to the question no. 1

a The part of a plant which is separated for tissue culture is called explant.

b The change and adaptation process in living organisms to originate and survive over a course of thousands of years is called evolution. During emergence of a new species through evolution, many species are lost in the passage of time. For example - dinosaurs. Darwin is called the founder of the evolution.

c Pollens are transferred in flowers through the process 'Q'. The steps of development of a pollen is described below:
The pollen is small, round, smooth or spiked. It contains a nucleus at its center. During the initial phase of development, the nucleus of the pollen divides through mitosis cell division. In this division, a large cell and a small cell is formed. The large cell is called tubal cell and the small one is called generative cell. The tube cell turns into pollen tube and generative cell divides into two male gametes. Through these steps, the development of a pollen completes.

d 'P' and 'Q' refer to the process of self-pollination and cross-pollination respectively. In nature, these two processes have an important role. In order to maintain the purity of a species, the role of self-pollination is very important. Transfer of pollen among same flowers of the same plant occurs in self-pollination so purity of species is maintained.
On the other hand, through cross-pollination much variation of plants is obtained and new characters emerge. The rate of germination in produced seed through cross-pollination is very high. The plant which is produced from this seed is capable of adapting in unfavorable environment easily. Thus there is no risk of extinction of the species.
Thus, the role of 'P' and 'Q' in maintaining purity of species, generation of new species and their adaptability in unfavorable environment is very important.

Ques. ▶ 2 Salma has a fruit garden. She observed that different types of insects are flying in her garden. By seeing her curiosity her father told, for keeping environmental balance, interaction-reaction of different living beings are very essential. *[D.B.-17]*

a. What is inflorescence? 1
b. What is meant by external-fertilization? 2
c. As per stem, what is the relation between garden plants with insect? Explain. 3
d. How reasonable the statement of Salma's father you think? 4

Answer to the question no. 2

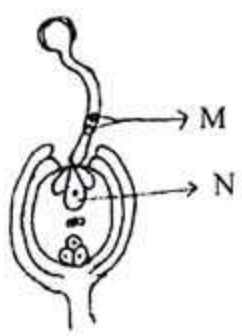
a A small branch with flowers arranged in a special order is called inflorescence.

b The fertilization process which occurs outside the body of the organism is called external-fertilization. This type of fertilization is usually limited to aquatic animals. For example-different types of fishes. However, there are exceptions, for example-sharks and some species of fishes.

c In the stem, there is a deep relation between garden plant and insect. The main condition for fruits to develop in garden plants is the occurrence of fertilization in it. Because fruit develops due to the slow internal changes of a flower after fertilization. Again, the main condition for the occurrence of fertilization is pollination. The insects of the garden acts as a carrier of pollination. When insects wander among the flowers due to the scent or to collect honey from those, pollination occurs through them, especially cross-pollination. After pollination, fertilization occurs there and later fruit develops inside them. So, if there is no insect in the fruit garden, cross-fertilization will be hindered and fruits will not develop. So, in the stem there is a relationship of pollination, viz-fertilization between garden plants and insects.

d In the stem, Salma's father stated that, for keeping environmental balance, interaction-reaction among different living beings are very essential. I think the statement is logical. In nature, the whole animal world is dependent on plants for food. This is because, only green plants can prepare their own food by photosynthesis with the help of CO_2. During photosynthesis plants discharges O_2. Animal world cannot survive without O_2. Again, during respiration all animals gives up CO_2 which is used in photosynthesis. So, the gaseous balance (O_2, CO_2) is maintained in the environment due to the interaction-reaction among different living beings. Besides, it is observed that, different insects such as bees, butterflies go to different flowers for collecting honey and pollination occurs due to this exchange. Many animals, bats survive on fruits and by their excretion the seed is transported and plantation spreads to different areas. In this way, environmental balance is maintained through the interaction-reaction among different living beings.

Ques. ▶ 3



[Dj.B.-17]

a. What is neurolema? 1
b. What is meant by automatic nervous system? 2
c. Explain the structure of M-marked part with figure. 3
d. Fusion of 'M' and 'N' is the regulator for surviving of living world. — Analyze. 4

Answer to the question no. 3

a The thin sheath around a nerve axon is called neurolemma.

b Autonomic nervous system controls the movement of the organs which are not under the influence of brain and spinal cord. Usually, the organs with involuntary muscles are regulated by this sytem. The functions of internal organs of thebody, e.g- heart, intestine, stomach, pancreas etc are regulated by the autonomic nervous system. As there is no influence of brain and spinal cord on the functions of the system, these organs are independent.

c The figure M in the stem is a male gamete. A male gamete is formed after pollen is germinated. After being matured, pollen grains start germination inside the pollen sac. The nucleus of pollen grain undergoes mitosis division and generates two dissimilar cells- one is much larger than the other. The larger cell is called tube cell and the smaller is called generative cell. The tube cell turns into pollen tube and division of generative cell gives rise to two male gametes.

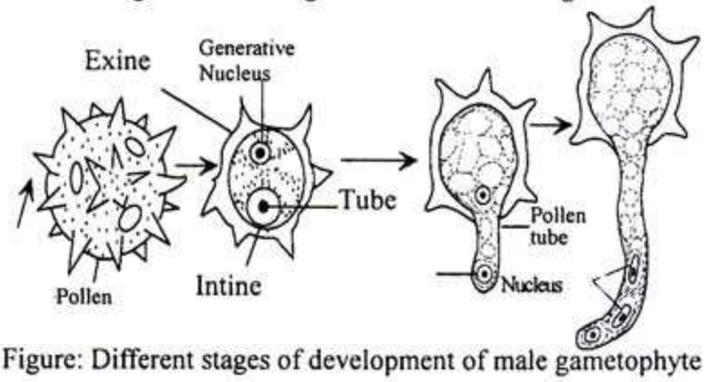


Figure: Different stages of development of male gametophyte

d The figure M and N represents the male gamete and egg of a flowering plant, respectively. The process in which male and female gametes unite to form a zygote is called fertilization. Fertilization of plants is a very important phenomenon, because every other animal of this world is dependent on plants for food, directly or indirectly.
As we know, plants, especially flowering plants are dependent on seeds to continue their reproduction. After fertilization, the fertilized egg slowly converts into seed and the ovary turns into fruit. Matured seed gives rise to new plant after being germinated. The fruits, leaves or seeds of plants are foods for various animals. Again, plants maintain the balance of oxygen and carbon di oxide in the environment.
So unification of M and N is an important regulator regarding the survival of living world.

Ques. ▶4 Mina has a garden. She observed that different types of insects are flying in her garden. About this matter she asked many questions to her father. By sceing her curiosity her father teld, for keeping environmental balance. interaction reaction of different living beings ary very essential *[Dj. B.-17]*

a. What is acrobic respiration? 1
b. What is meant by standard blood pressure? 2
c. What is the relation between garden plants with insect of the stem? Explain. 3
d. How reasonable the statement of Mina's father you think? Explain. 4

Answer to the question no. 4

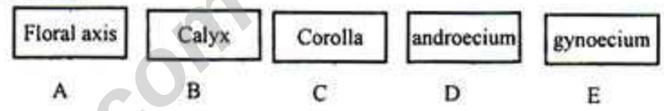
a Aerobic respiration is the process of producing cellular energy involving oxygen.

b According to the doctors, when an adult person has a blood pressure of nearly 120/80 mmHg, then it is called standard blood pressure. The systolic pressure is 120 mmHg or slightly less than that. The diastolic pressure is 80mmHg or slightly less than that. For leading a healthy life, it is important to control blood pressure to keep it within normal range.

c It has been mentioned in the stem that Mina observed different types of insects flying in her garden. There is an intrinsic relationship between the insect world and the plants, both of them are dependent on each other. Insects like butterfly, honeybee etc. travles from flowers to flowers for collecting honey. In this process, plants are benefited as those insects carry pollen grains and help in fertilization. After fertilization seeds and fruits are developed.
So these two living beings share a mutual relationship by helping each other.

d Mina's father quoted, "for keeping environmental balance. interaction reaction of different living beings ary very essential". I personally think that Mina's father has some point. In the stem, it was mentioned that the garden had some insects. Those insects are dependent on honey, produced in the flowers of plants. In return, these insects help in the fertilization process of plants, by carrying pollen grains from flower to flower. And thus plants can maintain their species. Moreover, the animals are directly, or indirectly dependent on plants for food and shelter. Plants keep the concentration of oxygen and carbon di oxide in air balanced. They prepare food by photosynthesis and gives off oxygen, without which the living world would not survive.
These interactions are crucial to have a balanced environment. Absence of one may affect the other. So Mina's father's statement was logical.

Ques. ▶5



[C.B.-17]

a. What is floral axis? 1
b. Write the difference between self-pollination and cross pollination. 2
c. Draw the figure of D andE 3
d. Analyse the importance of figure Din reproduction of plants. 4

Answer to the question no. 5

a Floral axis is a round shaped part of flower situated at the top of the stalk on the other four parts of the flower are arranged systematically.

b Differences between self-pollination and cross pollination–

self-pollination	cross pollination
1. Self-pollination occurs within same flower or different flower of same plant	1. Cross pollination occurs between two different plant's flowers of the same species.
2. In self-pollination new variant is not created.	2. In cross pollination new variants are created.

c D and E are respectively and as mentioned in the stimulus. Below their figures are drawn —

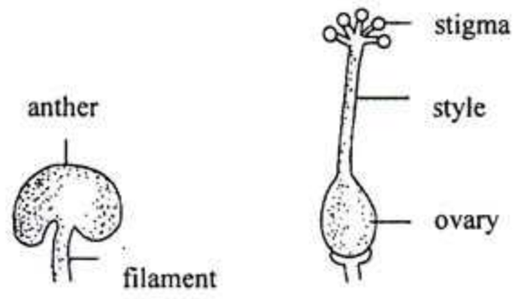


Figure: androecium figure: gynoecium

d Figure D is androecium as mentioned in the stimulus.
For plant reproduction, primary element is the seed. This seed is created through fertilization of male gamete and female gamete. Male gametes are produced by stamen which is an

essential whorl of flower, part of androecium. Androecium consists of one or more stamen. Stamen consists of anther and filament. Pollens are produced inside anther. This pollen then forms four daughter haploid pollen cells through meiotic division. These daughter haploid pollen cells are male gametes. Male gamete fuses with female gamete in ovary to form ovule. Which later transforms into seed. This seed after germination grows into a new plant.
So, it can be said androecium plays an important rolein reproduction of plants by producing male gametes.

Ques. ▶6

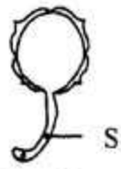


Fig : X

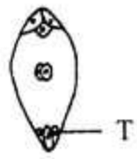


Fig : Y

[Ctg.B.-17]

a. What is Georeception? 1
b. Explain the use of pheromone to control the harmful insects. 2
c. Explain the structure of Figure-Y. 3
d. Analyse the significance of later condition after meeting of the 'S' and 'T'. 4

Answer to the question no. 6

a Georeception is the sensation of gravity by plant embryo root and upper part of embryo stem.

b Pheromone is one kind of hormone (chemical in nature) which is secreted from insects. It attracts the insects of the same species. Insect traps can be made by using pheromones as baits. Pests become attracted to the pheromones and gets trapped in the water alongside the trap. Thus harmful insects can be killed.

c The figure "Y" represents embryo sac. It is basically a cell with 8 nucleii. At the center of the cell, two nucleii merge to make a secondary nucleus. The embryo sac has two opposite poles. Collectively, the combined structure of the three cells near the micropyle is called egg apparatus. In between the cells, the one occupying the middle place is theovum, which is little larger. This is called an eggcell and the other two are called synargid cells. The cells in the opposite pole to the egg apparatus are called antipodal cells. So egg apparatus, secondary nucleus and antipodal cells altogether make up embryo sac.

d The "S" and "T" labeled part of the figures represent the male and female gamete of a flowering plant. Fertilization is the process where male gamete is combined with a female gamete or egg and produces diploid zygote. Fertilization allows production of fruits and seeds. Seeds carry out further reproduction of plants, and fruits are foods to some animals. We humans are totally dependent on plants. Without fertilization it would never have been possible for plants to return to their diploid state, maintanance of species would have been collapsed. So the later condition after meeting of S and T is very significant.

Ques. ▶7 Observe the following figures and answer the following questions :

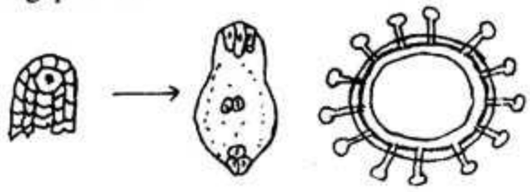


Fig-A Fig-B Fig-C

[S.B.-17]

a. What is featus? 1
b. What do you mean by Endosperm? 2
c. Explain the process of creating figure A from figure B. 3
d. Analyze with logic what you should do to protect this type of disease created by fig-C. 4

Answer to the question no. 7

a Fetus is an unborn offspring of a mammal, in particular an unborn human baby more than eight weeks after conception.

b Endosperm is a tissue produced inside the seeds of most of the flowering plants following fertilization. During fertilization, two male gametes are introduced to the embryo sac, one of them mates with the secondary nucleus and produces a triplod cell, which later develops into endosperm and stores food.

c In the stem, A figure is germ celll and B is embryo sac. Inside the ovary, female egg cell is produced. Thruough meiotic division, this cell divides into four haploid cells, three of them are destroyed, and the other one survives. The cell's nucleus divides through mitotic division and produces 8 nucleii. Two nucleii takes postion at the center of the cell and fuses to produce secondary nucleus. The other nucleii are equally oriented at the two different poles of the cell. Collectively, the combined structure of the three cells near the micropyle is called egg apparatus. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synargid cells. The cells in the opposite pole to the egg apparatus are called antipodal cells. This is how embryo sac is developed.

d The figure C shows an HIV virus. HIV causes AIDS. AIDS is a deadly disease, it attacks the white blood cells of and interrupts the antibody production in body. And so the immune system of the patient is totally destroyed. To avoid AIDS I can follow these steps-

1. Following religious rituals
2. Leading a controlled lifestyle
3. Before taking other's blood, it should be thoroughly checked if there is any HIV infection
4. HIV infected syringe and needle should be avoided
5. I should spread the awareness amont other people of the society.
6. It is possible to prevent HIV if we altogether be aware of the consequences of this deadly disease.

Ques. ▶8 Mr. Mamun, an agriculturist yisiting an orchard found that the gardeners were preparing seedlings by cutting trees. On the other side seedlings were also being prepared from seeds. Mr. Mamun said the gardeners that they needed some internal growth components. At last, he also said that this type of substances play a very important role in the reproduction of humans. *[J.B.-17]*

a. What is vernalization? 1
b. What do you understand by automatic nervous system? 2
c. Describe the growth substances that may help the gardeners in growing seedling well. 3
d. Explain the last utterance of the agriculturist Mr. Mamun. 4

Answer to the question no. 8

a Vernalization is the induction of a plant's flowering process by exposure to the prolonged cold of winter, or by an artificial equivalent.

b Autonomic nervous system controls the movement of the organs which are not under the influence of brain and spinal cord. Usually, the organs with involuntary muscles are regulated by this sytem. The functions of internal organs of the body, e.g- heart, intestine, stomach, pancreas etc are regulated by the autonomic nervous system. As there is no influence of brain and spinal cord on the functions of the system, these organs are independent.

c In the stem above, the growth substances are phytohormones, which can increase plant's growth rate at lesser amount of time. Their roles are described below-

Auxin: After the application of auxin, root grows from grafted buds, prevents the premature shed of fruits. In plant cell movement of auxin happens downwards. The rate of osmosis and respiration is increased on the effect of auxin. It also plays a role in producing fruits without seeds.

Gibberellin: Most of the gibberellins are found in mature seeds but they are also traced in seedling, cotyledons and meristematic regions of the leaves. Elongation of internodes are influenced by this phytohormone. So the plants grow excessively in length. If this hormone is applied to a stunted plant, it grows more in length than a normal plant. It plays effective roles in blooming flowers, in shortening the period of dormancy in seeds and in germination.

Cytokinin: Thisphytohormone or plant hormone is found in fruits, cereals and water of green coconut. It is also found in the roots of some plants. They generally stimulate the process of cell division being mixed in different concentrations with oxygen. Besides, the hormone also plays roles in the growth of cell, development of organ or plant parts, breaking the dormancy of seeds and organs and in delaying the aging process. At the time of cell division cytokinesis occurs in a cell because of the effect of cytokinin.

Ethylene: This hormone is a gaseous substance. It helps the fruit to be ripened. This hormone is also found in fruits, flowers, seeds, leaves and roots.

d Human reproduction system is controlled by various hormones. These hormones are called sex hormones. The glands which secret sex hormones are mentioned below-

1) Pituitary glad, 2) Thyroid glad, 3) Adrenal gland, 4) Testis, 5) Ovary and 6) Placenta.

Pituitary gland is the main hormoneproducing gland. Because Pituitary gland secretes several hormones which helps in the growth and regulation of the functions of reproductive organs, breast milk secretion, contraction of the uterus etc. Some of these pituitary hormones have influence on other endocrine glands.

Thyroxine hormone of thyroid gland is active in the expression of sexual behavior, mental behavior and metabolism. Hormones of adrenal gland regulates the growth of reproductive organs and help express sexual behaviors. Testosterone and androgen hormones from testes allows the growth of beard and change in vocal cord. Estrogen, relaxin and progesterone from ovary regulates menstrual cycle, egg production, female behaviors, development of embryo, placenta and uterus during pregnancy. Placental hormones gonadotropin and progesterone excite the ovary and develops mamary glands.

So Mr. Mamun's statement was logical.

Ques. ▶ 9

P	Q
Chinese Hibiscus Datura (Bisexual)	(i) Cotton tree (Male Flower) (Shimul) (ii) Polash (Female Flower)

[J.B.,B.B.-17]

a. What is reproduction? 1
b. What do you understand by fly-pollinated flowers? 2
c. Describe the development of gametophyte of Q (i). 3
d. Which type of pollination mentioned in the stem P and Q has more advantages? 4

Answer to the question no.9

a Reproduction is the natural process where an organism produces its offsprings.

b The flowers that are pollinated by flies are named as fly pollinated flower. These flowers are brightly colored, contains smells and necter glands to attract flies. Their pollen grains and stigma is sticky in nature.

c The Q in the stem is the male flower of Shimul. Production of male gamete is described below-

A pollen is the first cell of the gametophyte. Soon after becoming mature harbouring in the pollen sac starts to germinate. The nucleus of the pollen gets divided through mitotic division and two cells, one large and another small, are formed. The large one is called tube cell and the small one is called generative cell. The tube cell turns into pollen tube and two male gametes are produced. Division of generative cell takes place in the pollen or pollen tube.

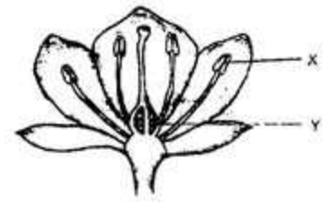
d from the stem, it has been observed that P is a bisexual flower and self pollination happens in P. On the other hand, Q is an incomplete flower which allows it to undergo cross pollination.

The comparative discussion between self and cross pollination events are described below-

	Self Pollination	Cross Pollination
1.	Wastage of pollen grains is minimum	Wastages of pollen grains are maximum
2.	No carrier is needed	Carrier is a must
3.	Parental traits are conserved.	3. Offspring gets mixed trait
4.	The offspring aquire less survival capacity.	Survival capacity is the best in cross pollinated plants
5.	Less adaptation ability	Higher adaptation ability
6.	No new species is created	New species is created

So it can be said that cross pollinated plants have the more benefits than self pollinated plants.

Ques. ▶ 10



[R.B.-16]

a. What is bone? 1
b. Explain the photoperiodism. 2
c. Describe how gametophyte is developed inside labelled 'X' part. 3
d. Labelled 'X' and 'Y' directly takes part in reproduction – Analyse. 4

Answer to the question no. 10

a Bone is a modified connective tissue forming skeleton of the vertebrates.

b The effect of day length on the flowering of plants known as the photoperiodism. Plants require a particular day length for flower which varies from species to species. Depending on photoperiod, some plant flower in long days of summer and others flower in the short days of winter. There is a third group of plants which flower in any season of the year. Based on the photoperiod plants are grouped into three groups :

i. Long day plants.
ii. Short day plants.
iii. Day neutral plants.

c The 'X' part of the figure in the stem is the anther of the flower. Within the anther microspores are developed. The pollen or microspore is the 1st cell of the male gametophyte. From the microspore the male gametophyte is described below:

Microspore is the 1st cell of the male gametophyte. It is unicellular and contains a haploid nucleus. It is covered by two membranes, the outer one is known as the exine and the inner one is known as in time.
The exine wall is thick and rigid and contains some pores known as germ pores. The intrine is thin, delicate and elastic. The mature microspore comes out of the anther and transferred to the stigma by some agents. On the stigma development of the male gametophyte begins. The nucleus divides unequally and form two daughter nuclei. The smaller one is known as the generative nucleus and the larger one is known as the tube nucleus. Stimulated by the stigmatic fluid the intine grows and comes out as a tube through the germ pore. This tube is known as the pollen tube within the pollen tube the tube nucleus migrates first and the generative nucleus follows it. In the pollen tube the generative nucleus divides by mitosis and form nuclei. Each of these two daughter nuclei then becomes surrounded by cytoplasm and form two male gametes. Thus a mature male gametophyte is a tubular body within which two male gametes and one tube nucleus remain present.

d The 'X' and 'Y' marked parts of the figure in the stem are the anther and ovary of a flower respectively. These two parts of the flower directly participate in sexual reproduction. Without their presence, sexual reproduction in plants is impossible. This statement can be proved from the following discussion.
We know that fertilization is the precondition for sexual reproduction. Fertilization takes place by the union of the male and female gametes.
The male gametes develop from the microspores produced coithin the another. On the other hand the female gamete or ovum or egg is produced inside the ovule developed within the ovary. After pollination, the pollen tube penetrates the tissue of the stigma and ovary and then release the gametes in the embryo sac of the ovule. Within the embryo sac one of the two male gametes released from the pollen tube come in contact of the egg or ovum. The union of male and female gametes is known as fertilization. The fertilized egg is converted into zygote. The zygote develops into the embryo which grow into a new plant. Thus the sexual reproduction of plants is completed.
So, from the above discussion, it becomes clear that without the another (X) and ovary (Y) development of male and female gametes will not develop and sexual reproduction will not take place. Thus we may conclude the two parts (X) and (Y) of a flower. directly participate in reproduction.

Ques. ▶ 11

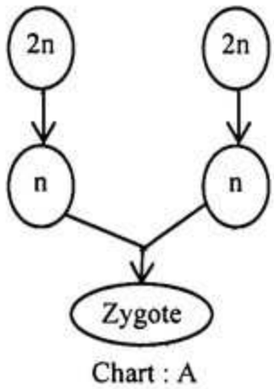


Chart : A

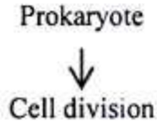


Chart : B

[Dj.B.-16]

a. Write down the full form of ICBN. 1
b. What do you mean by classification? 2
c. How the chart 'A' is related with the living being? Explain it. 3
d. What role will be played by the chart 'B' for our economic development? Write it with your logic. 4

Answer to the question no. 11

a International code of Botanical nomenclature.

b Classification is the grouping of different organisms into groups and sub-groups depending on their similarities and dissimilarities and then arranging these groups in specific order following some rules, Aim of classification is to gather knowledge about organism in shortest possible time and thereby to have a broad or overall knowledge about the group and the whole groups of organism with case. It also helps to identify an unknown organism easily and giving it a proper systematic position in the living world. It also helps to indentify the organisms beneficial to human kind and protect the beneficial organisms.

c The chart 'A' in the stem shows the process of fertilization in higher organisms. It is closely associalted with the reproduction and thereby maintain their existance.
The existance of a species depends on its capacity of reproduction. Higher organisms generally reproduce sexually and produce their new progeny. Thus the process of reproduction estabish the existance of the organism. The higher organisms are diploid (2n) in nature and from the diploid (2n) mother and father haploid gametes (n), eggs and sperms, are produced. The egg and sperms unite in the process of fertilization and produce a diploid (2n) zygote. From this zygote, develops the embryo and new plants or animals by gradual and repeated mitotic division. In case of plants, the seed develops from the fertilized ovule and the embryo remain imbedded within the seed. On germination of the seed the embryo grows and comes out of the seed and develop into a new plant. On the other hand, the fertilized egg develops into the embryo within the mother's womb and converted to fetus (baby).
After certain period, the mother gives birth of a new baby and the baby grows and matures to complete animal including man. So, the existance of a(2n) organism is not possible without the process 'A' shown in the figure of the stem. From the above discussion, it may be concluded that there is a close relationship between the existance of the organism and the 'A' process.

d The 'B' chart in the stem indicates the micro-organisms of the kingdom 'Monera'. Because the organisms of this kingdom are microscopic and prokaryotic. Bacteria and Bluegreen algae (Cyanobacteria) occupy mentionable position in this kingdom. The organisms of this kingdom reproduce by cell division. The 'B' organisms or the microbes play an important role in our economy. It is discussed below:

i. Different antibiotics are vaccines for different diseases are produced from bacteria. The vaccines and antibiotics produced from bacteria are used in treatment and prevention of several diseases. These drugs also being exported abroid which brings foregn currency and helps in our economic growth.
ii. Bacteria play an importent role in the processessing of tea, tobacco. We export tea and tobacco products which helps our economic growth by earing foreign currency.
iii. Bacteria are used in preparing curd, yogarf, cheese, butter which are popular foods in the country.
iv. Bacteria helps in rotting and thus helps in seperating jute fibres from the sticks. Jute and jute products are exported and that earns foreign currency.
v. Bacteria and Blue green algae are used for nitrogen fixation and thus increase the soil fertility and enhances production of economic crops. It also saves money required for artificial chemical fertilizer used by the farmers. Recently use of these microbes have been started as Bio-fertilizers.

Thus the microorganisms (B) play an important role in our economic growth.

Ques. ▶ 12 A shoot of a fruit plant of Abonktika's garden grown up into a tree. Fruits of this plant spreads around the long distances by the animals, birds and water. For this reason living being are benefited. *[Ctg.B.-16]*

a. What is flower? 1
b. What is meant by reproduction? 2
c. How the shoot of the plant of Abontika's garden grown into a tree—explain. 3
d. How the seed and fruits disperse thrown the mentioned medium in the stem? 4

Answer to the question no. 12

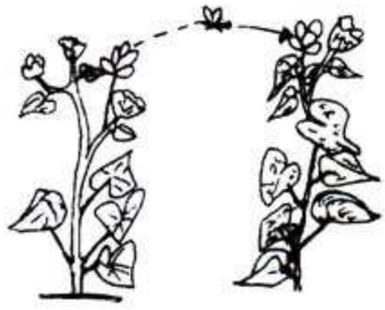
a The flower is a modified shoot specially adapted for sexual reproduction of plants.

b The process in which one organism produces a new generation like itself is known as reproduction. Reproduction is one of the most important characteristics of the living organisms. Reproduction may take place in two ways- (i) Sexually or (ii) Asexually.
Most of the lower organisms reproduce asexually and the higher organisms reproduce asexually. Flower is the sexual reproductive organ of higher plants.

c The sapling of the fruit plant in Abontika's garden developed from the seed by germination. The embryo present in the seed grows and develops in suitable condition and comes out of the seed and develop as the new plant or sapling. The growth of the root and shoot of the plant takes place by mitosis cell division. The tip of the root and stem contain meristematic tissue. The meristematic cells divide by mitosis. As a result of rapid mitotic division of meristematic cells the gorwth and development of the root and the shoot take place and the plant sapling develops into a mature plant. The water and minerals required for this growth of the sapling is absorbed by the root. The shoot on the other hand manufacture corbohyrate food by photosynthesis. For these reasons, the plant sapling of Abontika's garden grows quickly by the process of mitosis and converted to a mature fruit tree.

d In the stem three media for dispersal of fruit and seeds have been mentioned. The analysis of the three media involved in fruit and seed dispersal have been done bellow.
By the birds: Sometimes the birds carry fruits and seeds in their beaks and take them at distance places. Sometimes the birds eat the fruits including the seeds. The seed when not digested in the alimentary canal pass through the digstive system as feaces. Thus the dispersal fo seeds and fruits may take place.
By animals: Different fruit surface is variously ornamented with spines and hooks. By these spines or hook fruits become attached to the body of the animals and carried to distant places. Besides that animals carry fruits for future use and thus performs dispersal.
By water: Seeds and fruits at aquatic plants and plants growing side the rivers and ocean are dispersed by water.
There are air cavities for floating in such seeds, eg coconut, lily etc.

Ques. ▶ 13



[J.B.-16]

a. What is flower? 1
b. What do you mean by inflorescence? 2
c. What is called the process of figure? Explain it. 3
d. What problems will be create in environment when mentioned process will not happen. Give your opinion. 4

Answer to the question no. 13

a The flower is a modified shoot specially adapted for sexual reproduction by plants.

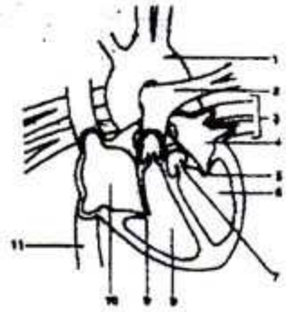
b The mode of arrangement of a collection number of flowers on the branch or branch system is known as inflorescence. The branch on which a collection of flowers develop is known as the peduncle. There are two principal types of inflorescence– (i) Racemose and (ii) Cymose. In the racemose type of inflorescence indefinite number of flowers are developed and in the cymose inflorescence number of flowers is limited.

c The process shown in the figure of the stem is the pollination of flowers. Pollination is the process in which pollen grains of a flower is transferred from the another to the stigma of the same flower or another flower of the same species. There are two types of pollination– (i) Self pollination– When pollivation takes place between the flowers of the same plant and (ii) Cross pollination– When pollination takes place between the flowers of different plants of same species.
The process shown in the stem is the cross pollination. For cross pollination different pollinating agents are required. Here in the figure an insect is seen to carry pollen from one plant to the other.
So, the process is justifyingly a cross pollination.

d The transfer of pollen from the anther to the stigma of anther flower of the same species is called cross pollination. In the figure of the stem, cross pollination has been shown. As a result of cross pollination, new characteristics are created, the rate of seed germination becomes high, the viability of seeds increases, plants become more tolerable to infavourable condition and ultimately new species are developed. As in cross pollination, pollination takes place between two plants with different characteristics, the seeds produced in this process contain new characters. The plants thus produced from cross pollinated seeds become more viable with the new characters. As new characters accumulate in the cross pollinated plants, it gives rise to new varieties. Thus the plants produced in cross pollination can tolerate different changed environment and grow normally in the changed environment.
Without cross pollination addition of new characters does not take place in the progeny and the new variety is not produced. Thus the plants become unable to grow in changed or diversified environment. For this reason, there have some chance for the extinction of the species in the changed environment.

So, from the above discussion, it can be clearly concluded that without cross pollination, balance of environment will be lost and the plants and animals may extinct.

Ques. ▶ 14



[Mirzapur Cadet College, Tangail]

a. What is blood? 1

b. What do you mean by blood plasma? Name the components of plasma. 2
c. Name the parts of the organ numbered from 1 to 11. 3
d. Analyze the importance of organ given as stem. 4

Answer to the question no. 14

a Blood is a viscous, slightly alkaline and salty fluid.

b Plasma is the colourless fluid part of plasma constitutes about 55% volume of whole blood. The main component of plasma is water. A small amount of protein, organic substances and a small portion of inorganic salts are dissolved in it. The substances which are present are as follows —
Protein, such as, albumin, globulin, fibrinogen (2) glucose (3) small droplets of fats (4) mineral salts (5) vitamins (6) hormones (7) antibodies and (8) amino acids.

c The organ mentioned in the stem is heart. The name of the parts of heart from 1- 11 is given below —
1. Aorta; 2. Pulmonary artery; 3. Pulmonary vein; 4. Left atrium; 5. Bicuspid valve; 6. Left ventricle; 7. Aortic valve; 8. Right ventricle 9. Tricuspid valve; 10. Right atrium; 11. Inferior vena

d The organ mentioned in the stem is heart. The importance of heart is given below —
The right-hand side of the heart receives de-oxygenated blood from the body tissues (from the upper- and lower-body via the Superior Vena Cava and the Inferior Vena Cava, respectively) into the right atrium. This de-oxygenated blood passes through the tricuspid valve into the right ventricle. This blood is then pumped under higher pressure from the right ventricle to the lungs via the pulmonary artery. The left-hand side of the heart receives oxygenated blood from the lungs (via the pulmonary veins) into the left atrium. This oxygenated blood then passes through the bicuspid valve into the left ventricle. It is then pumped to the aorta under greater pressure. This higher pressure ensures that the oxygenated blood leaving the heart via the aorta is effectively delivered to other parts of the body via the vascular system of blood vessels.

Ques. ▶ 15 The biological function of a flower is to effect reproduction in angiosperm. *[Rajshahi Cadet College, Rajshahi]*
a. What is biodiversity? 1
b. Write about the significance of glycolysis. 2
c. Describe the cell division for producing gamete inside the organ mentioned in the stem. 3
d. Evaluate the given statement in stem as reproductive organ. 4

Answer to the question no. 15

a Biodiversity is the variety of all living things; the different plants, animals and microorganisms, the genetic information they contain and the ecosystems they form.

b Glycolysis is the first of the main metabolic pathways of cellular respiration to produce energy in the form of ATP. Overall, the process of glycolysis produces a net gain of two pyruvate molecules, two ATP molecules, and two NADH molecules for the cell to use for energy.

c The organ mentioned in the stem is flower. Meiosis is a special kind of cell division in which the chromosome number is reduced in half. The cell division for producing female gamete inside the organ is described below —
Near the micropyle being nourished in the nucleus of an ovule, a cell starts to become larger. Its protoplasm is dense and the nucleus is comparatively larger. The cell divides into four haploid cells through meiotic division. Every cell except the smallest one, gets disintegrated. Growing gradually, the larger cell matures into an embryo sac. The nucleus of the cell is haploid. The nuclei are evolved as the nucleus divides. These two nuclei take position in two opposing poles. Next, these two nuclei consecutively divide twice and result in four nuclei. In the next stage, two nuclei form the two poles coming at the middle of the cell get fused and cause the emergence of two haploid secondary nuclei.

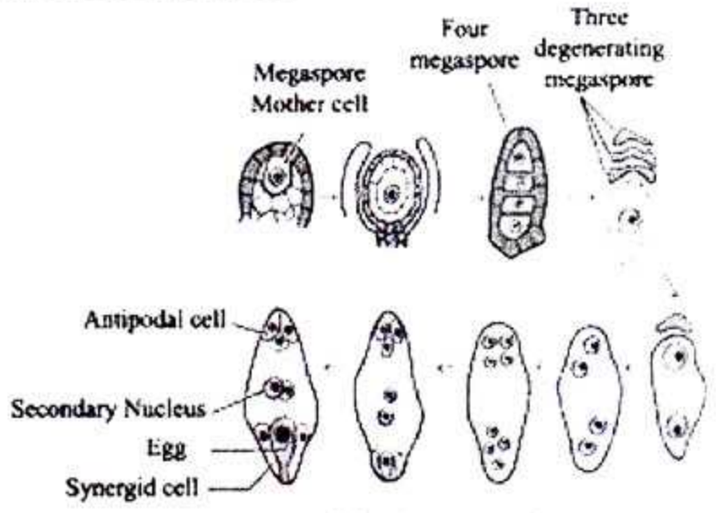
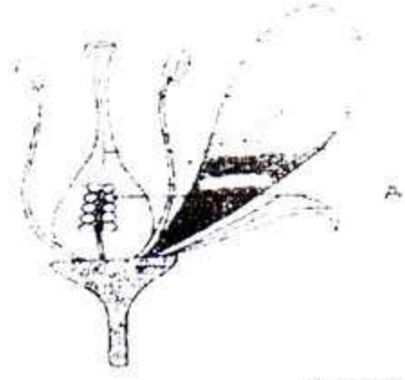


Fig : Formation of female gametophyte.

The nuclei in the two poles turn into cells with some amount of cytoplasm. Collectively, the combined structure of the three cells near the micropyle is called egg apparatus. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synargid cells. The cells in the opposite pole to the egg apparatus are called antipodal cells. This way the process of developing embryo sac is ultimately done.

d "The biological function a flower is to effect reproduction in angiosperm"- the statement is evaluated below —
A flower, sometimes known as a bloom or blossom, is the reproductive structure found in flowering plants called angiosperms. The biological function of a flower is to effect reproduction, usually by providing a mechanism for the union of sperm with eggs. Flowers may facilitate outcrossing (fusion of sperm and eggs from different individuals in a population) or allow selfing (fusion of sperm and egg from the same flower). Some flowers produce diaspores without fertilization. Flowers contain sporangia and are the site where gametophytes develop. Flowers give rise to fruit and seeds. Many flowers have evolved to be attractive to animals, so as to cause them to be vectors for the transfer of pollen.

Ques. ▶ 16



[Pabna Cadet College, Pabna]
a. What is aerobic respiration? 1
b. Write down the differences between water and mineral salt absorption process in plants. 2
c. Draw a well labeled diagram of mentioned part A shown in above figure. 3
d. How an egg is formed inside the mentioned part–A? Explain. 4

Answer to the question no. 16

a The respiration process, which requires oxygen and produces CO_2, H_20 and a large amount of energy by oxidizing the respiratory materials (carbohydrates, proteins, lipids, different kinds of organic acids) completely, is called aerobic respiration.

b Absorption Difference between Water and Mineral salt

Water

- Process of the absorption: Mostly through passive absorption.
- Metabolic absorption: It is not required directly in water absorption.
- Condition of Elements: Absorbed as water molecules.
- Regions for absorption: Most of the water is absorbed through root hair regions.

Mineral salt

- Process of the absorption: Mostly through active absorption.
- Metabolic absorption: It is required directly in mineral absorption.
- Condition of Elements: Absorbed as mineral salt ions.
- Regions for absorption: Most of the mineral salt is absorbed through the apical regions of roots where cell division occurs.

c Part "A" mentioned in stem is known as ovary. A well-labeled diagram of ovary is drawn below-

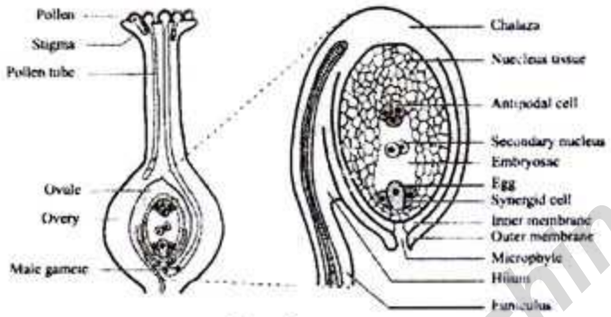


Fig: Ovary

d Part "A" mentioned in stem is known as ovary. How an egg is formed inside the ovary is explained below —

Near the micropyle being nourished in the nucleus of an ovule, a cell starts to become larger. Its protoplasm is dense and the nucleus is comparatively larger. The cell divides into four haploid cells through meiotic division. Every cell except the smallest one, gets disintegrated. Growing gradually, the larger cell matures into an embryo sac. The nucleus of the cell is haploid. The nuclei are evolved as the nucleus divides. These two nuclei take position in two opposing poles. Next, these two nuclei consecutively divide twice and result in four nuclei.

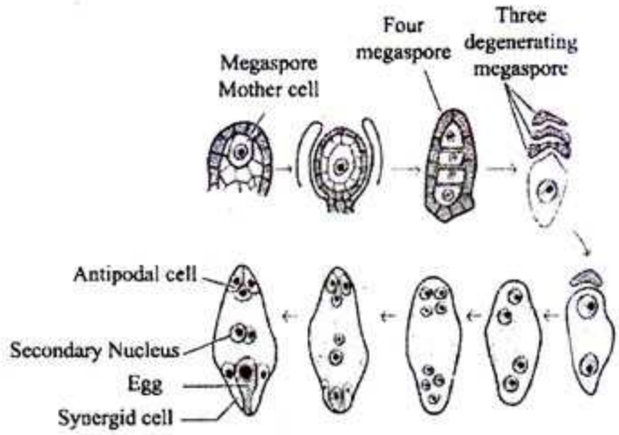


Fig : Formation of the female gametophyte

In the next stage, two nuclei form the two poles coming at the middle of the cell get fused and cause the emergence of two haploid secondary nuclei. The nuclei in the two poles turn into cells with some amount of cytoplasm. Collectively, the combined structure of the three cells near the micropyle is called egg apparatus. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synergid cells. The cells in the opposite pole to the egg apparatus are called antipodal cells. This way the process of developing embryo sac is ultimately done.

Ques. ▶17

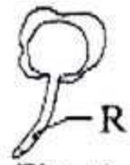


Fig-X

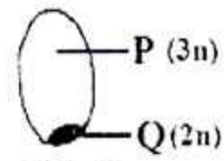


Fig-Y

[Rangpur Cadet College, Rangpur]

a. What is phytohormone? 1
b. What does it mean by Mutualism? 2
c. Explain how labelled 'R' of Fig-X helps to produce 'P' and 'Q' of Fig-Y. 3
d. Analyze the importance of the mechanism that requires in the production of Fig-Y inside a flower. 4

Answer to the question no. 17

a The biochemical substance which is produced in the plant body and regulates growth and development of the plant, is called phytohormone.

b Mutualisms are defined as interactions between organisms of two different species, in which each organism benefits from the interaction in some way. Sometimes mutualisms are symbiotic relationships.

c "R" mentioned in the stem is male gamete which is stored in pollen tube and "p" and "Q" mentioned in the stem are endosperm cell and zygote cell respectively. How male gamete helps to produce endosperm cell and zygote cell is explained below —

Ttrough pollination, mature pollen lands on the stigma of a carpel. Then pollen tube grows penetrating the style and becomes little flatulent absorbing some liquid. Once the tips of the extended pollen tube entering into the embryo ejects two male gametes in the embryo sac. One of them meeting with the egg causes the emergence of a zygote. Another male gamete mixing with the secondary nuclei develop triploid endosperm cells. The two fusions, mixing of a male gamete with an egg and mixing of another male gamete with secondary nuclei, take place at about the same time. This phenomenon is called double fertilization.

d Fig- "Y" mentioned in the stem states the fertilization process. The importance of the fertilization process is analyzed below —

The haploid farm of two gametes art transformed into a diploid form of zygote (2n). The ovules are converted into seeds. The ovary is turned to a fruit. The seeds formed by fertilization protect the generation of plants. Thus it is noticed that seeds and fruits are formed due to fertilization. Seeds and fruits formed due to fertilization are used as food for animal kingdom. Fertilization ensures diploid of the organism by fusion of haploid male and female gametes. Fertilization process increases the metabolic activities and the rate of protein synthesis of the egg. Fertilization initiates embryogenesis. Fertilization provides new genetic constitution to the zygote. Fertilization process increases the metabolic activities and the rate of protein synthesis of the egg.

Ques. ▶ 18

Fertilization	Placenta
P	Q

[Rangpur Cadet College, Rangpur]

a. What is puberty? 1
b. Why AIDS is called killer disease? 2
c. Write the significance of "P"? 3
d. "For the development of the embryo, Q is the essential part"— Explain? 4

Answer to the question no. 18

a Thy transitional period adolescence indolence and the youth is named as puberty.

b AIDS is called a killer disease because it's virus HIV destroys white blood cells, causes obstacle in antibody formation. It destroys the victims immune system. So, the ultimate fate is death.

c "P" mentioned in the stem is fertilization. The importance of fertilization is given below —
The haploid farm of two gametes art transformed into a diploid form of zygote (2n). The ovules are converted into seeds. The ovary is turned to a fruit. The seeds formed by fertilization protect the generation of plants. Thus it is noticed that seeds and fruits are formed due to fertilization. Seeds and fruits formed due to fertilization are used as food for animal kingdom. Fertilization ensures diploid of the organism by fusion of haploid male and female gametes. Fertilization process increases the metabolic activities and the rate of protein synthesis of the egg. Fertilization initiates embryogenesis. Fertilization provides new genetic constitution to the zygote. Fertilization process increases the metabolic activities and the rate of protein synthesis of the egg.

d "Q" mentioned in the stem is placenta which is essential part for the development of the embryo. This explained below —
The embryo is implanted into the uterine wall with the help of the placenta. The embryo needs food for its growth. Carbohydrate, (glucose), protein (amino acid), essential minerals, water etc. are transferred from maternal to fetal blood to nourish the developing embryo. The placenta acts more or less like a lung. The dissolved oxygen in the blood of the maternal blood diffuses into the fetal blood and exchanges carbon dioxide from the fetus to the mother. The placenta also acts as kidney; metabolic waste product is diffiused from the embryonic blood capillaries into the mother's blood stream. In this way the waste products are eliminated. The placenta produces some important hormones which protect the embryo and helps in normal development.

Ques. ▶ 19

Fig: A Fig: B

[Cumilla Cadet College, Cumilla]

a. What is stamen? 1
b. What is endosperm? Explain. 2
c. How does Fig-A turn into Fig-B? Explain. 3
d. Analyze the role of different animals for the above change. 4

Answer to the question no. 19

a Stamen is the pollen-producing male organ of a flower that consists of an anther and a filament.

b The endosperm is the tissue produced inside the seeds of most of the flowering plants following fertilization. It surrounds the embryo and provides nutrition in the form of starch, though it can also contain oils and protein.

c Fig- "A" and Fig- "B" mentioned in the stem states a flower and a plant respectively. How does a flower turn into a plant is explained below —
Fertilization in flowering plants happens through a process called pollination. Through pollination, mature pollen lands on the stigma of a carpel. Then pollen tube grows penetrating the style and becomes little flatulent absorbing some liquid. Once the tips of the extended pollen tube entering into the embryo ejects two male gametes in the embryo sac. One of them meeting with the egg causes the emergence of a zygote. A zygote is the first cell of a sporophyte. Two cells are produced after its first division. At the same time, flourishing of endosperm is also ignited. A zygote divides transversely. The cell towards the micropyle is called the basal cell and the cell towards the centre of the embryo sac is called the epical cell. Gradually, the apical cell turns into embryo. At maturity, the ovule with the endosperm and embryo turns into a seed. As the seed germinates, a complete sporophyte is developed.

d Through pollination a flower turns into a plant. The role of different animals in pollination are given below —
Animal pollinators play a crucial role in flowering plant reproduction and in the production of most fruits and vegetables. The most recognized pollinators are the various species of bees. Honey bees travel from flower to flower, collecting nectar and pollen grains. The bee collects the pollen by rubbing against the anthers. The pollen collects on the hind legs, in a structure referred to as a "pollen basket". As the bee flies from flower to flower, some of the pollen grains are transferred onto the stigma of other flowers. Bats are important pollinators of some tropical flowers, visiting to take nectar, Birds, particularly hummingbirds, honeyeaters and sunbirds also accomplish much pollination, especially of deep-throated flowers. Other vertebrates, such as kinkajous, monkeys, lemurs, possums, rodents and lizards have been recorded pollinating some plants.

Ques. ▶ 20 Look at the figure and answer the following questions.

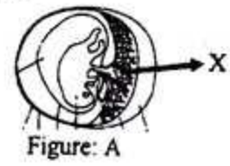


Figure: A

Figure: B

[Feni Girls' Cadet College, Feni]

a. What is Impulse? 1
b. What do you mean by Epilepsy? 2
c. Write down the symptoms of the disease caused by the entity of figure B. 3
d. Is there any role of X in the development of embryo? Give arguments to your opinion. 4

Answer to the question no. 20

a Impulse is the signal that travels along the length of a nerve fiber and ends in the release of neurotransmitters.
b Epilepsy is a type of brain disease that starts with convulsion. In many cases the patient becomes unconscious.

c Fig: "B" mentioned in the stem states AIDS. The symptoms of AIDS are given below —
- Rapid loss of baby weight.
- Fever for more than one month for unknown reasons.
- Dry cough for more prolonged period.
- Puffiness and swelling of some organs, such as: face, eyelid, nose etc.
- Pain in armpit, neck and face become rough.
- Itching in the whole body.

d "X" mentioned in the stem in fig: "A" is placenta. The role of placenta in the development of embryo is given below —
The embryo is implanted into the uterine wall with the help of the placenta. The embryo needs food for its growth. Carbohydrate, (glucose), protein (amino acid), essential minerals, water etc. are transferred from maternal to fetal blood to nourish the developing embryo. The placenta acts more or less like a lung. The dissolved oxygen in the blood of the maternal blood diffuses into the fetal blood and exchanges carbon dioxide from the fetus to the mother. The placenta also acts as kidney; metabolic waste product is defused from the embryonic blood capillaries into the mother's bloodstream. In this way the waste products are eliminated. The placenta produces some important hormones which protect the embryo and helps in normal development.

Ques. ▶21 Look at the stem and answer the questio below :

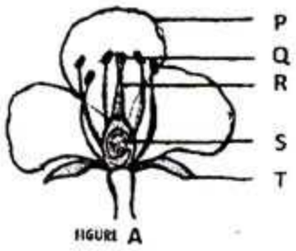


FIGURE A

[Faujdarhat Cadet College, Chattogram]

a. What is binomial name? 1
b. Why transpiration is called necessary evil? 2
c. Write down the name and function of P, R and T mentioned above stem. 3
d. Explain what type problems there will arise if part Q in the stem is absent. 4

Answer to the question no. 21

a The binomial name or the scientific name of an organism has two parts. The first part of the name denotes the genus to which the species belongs; the second part identifies the species within the genus.

b Though transpiration contributes many uses to a plant, it also plays some harmful roles. For instance, if the rate of loss of water is greater than the rate of its absorption, this will cause deficiency of water and minerals in the plant. As a result, the plant may die. So, it can be said that transpiration is an essential activity for a plant though it causes some harms to it. That is why transpiration is called a necessary evil.

c "P", "Q" and "T" mentioned in the stem are Corolla, anther, and sepal respectively. Their functions are written below —
Corolla: Corolla is usually colorful. They protect the internal parts of a flower from the sun and rain. Bright colorful corolla attracts animals - birds, insects etc., and helps pollination. Sometimes insects draw nectar from the corolla of a flower.
Anther: Pollens are developed in an anther. A pollen tube is produced from a pollen after germination. The male gamete is produced in the pollen tube. The male gametes directly take part in reproduction.
Sepal: The initial function of sepals is to provide support and protection for a flower bud as they close up around it until it's ready to bloom.

d "Q" mentioned in the stem is anther where pollens are developed. Male gamete is produced in the pollen tube. Types of problems there will arise if anther is absent in flower are explained below —
The male organs are the anthers and the filaments, which together are the stamen. Anthers hold the pollen that contains the sperm necessary for reproduction. The long filaments hold the anthers up from the center of the flower to increase the chances that a visiting pollinator will brush against the anthers and collect the pollen. When the pollinator travels to the next plant, the pollen falls from its body onto the female organs of the flower. The pollen then sends sperm into ovary to fertilize the waiting egg. Without the anthers producing the sperm and the pollen, the flower cannot reproduce.

Ques. ▶22 In classroom Dr. Nahar said that embryonic memberane protect embryo though a particular organ built up from mother and fetal tissue for the development of embryo.

[Sylhet Cadet College, Sylhet]

a. What is Balstocyst? 1
b. What do you mean by fetus? 2
c. How that membrane works in human body. 3
d. The tissue mentioned in the stem is important for that development. Give your logic on it. 4

Answer to the question no. 22

a The blastocyst is a structure formed in the early development of mammals.

b A fetus is defined as an "unborn, developing mammal" and occurs around the tenth week of pregnancy.

c The embryos of each species have a series of embryonic membranes which are essential for easy, normal and safe development of the embryo. These help in fetus nutrition, gaseous exchange and elimination of waste products. The embryonic membrane protects the fetus (embryo) and controls other important actions.

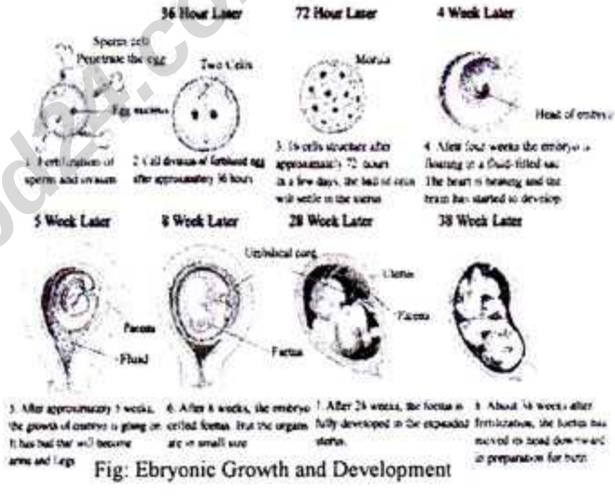


Fig: Ebryonic Growth and Development

d The fetal tissues are important for the development of embryo. My logic is given below —
The embryo is implanted into the uterine wall with the help of the placenta. The embryo needs food for its growth. Carbohydrate, (glucose), protein (amino acid), essential minerals, water etc. are transferred from maternal to fetal blood to nourish the developing embryo. The placenta acts more or less like a lung. The dissolved oxygen in the blood of the maternal blood diffuses into the fetal blood and exchanges carbon dioxide from the fetus to the mother. The placenta also acts as kidney; metabolic waste product is defused from the embryonic blood capillaries into the mother's bloodstream. In this way the waste products are eliminated. The placenta produces some important hormones which protect the embryo and helps in normal development.

Ques. ▶23 Flower is the reproductive organ of higher plants. To produce seeds and fruits flower undergo many changes. In male and female part changes occur to produce gametes. After that the union of gametes occurs and fruits and seeds are produced. *[Jhenidah Cadet College, Jhenidah]*

a. What is pregnancy? 1
b. Why testosterone and estrogen is important? 2
c. With diagram describe the process of production of female gamete in plants. 3
d. Discuss about the process of last line mentioned in stem. 4

Answer to the question no. 23

a Pregnancy is the condition of having a developing embryo or foetus in the body, after union of an ovum and spermatozoon.

b Testosterone hormone secreted from the testis and androgen help to produce sperms and secondary sexual characteristics, such as deepening of the voice and growth of a beard. The Ovary secretes estrogen, progesterone, and relaxin hormones. These hormones cause the development of sexual characteristics, such as: menstruation, enlargement of the well of uterus for implantation of the embryo and placenta.

c The process of female gamete production is described below —

Near the micropyle being nourished in the nucleus of an ovule, a cell starts to become larger. Its protoplasm is dense and the nucleus is comparatively larger. The cell divides into four haploid cells through meiotic division. Every cell except the smallest one, gets disintegrated. Growing gradually, the larger cell matures into an embryo sac. The nucleus of the cell is haploid. The nuclei are evolved as the nucleus divides. These two nuclei take position in two opposing poles. Next, these two nuclei consecutively divide twice and result in four nuclei.

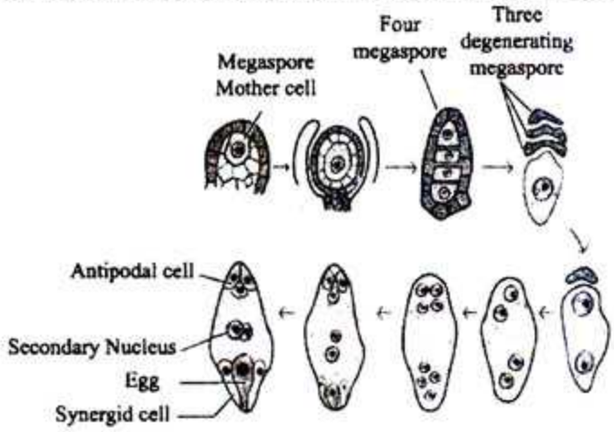


Fig : Formation of female gametophyte

In the next stage, two nuclei form the two poles coming at the middle of the cell get fused and cause the emergence of two haploid secondary nuclei. The nuclei in the two poles turn into cells with some amount of cytoplasm. Collectively, the combined structure of the three cells near the micropyle is called egg apparatus. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synergid cells. The cells in the opposite pole to the egg apparatus are called antipodal cells. This way the process of developing embryo sac is ultimately done.

d Union of male and female gamete is known as fertilization. Through fertilization Fruits and seeds are produced. This is discussed below —

Through pollination, mature pollen lands on the stigma of a carpel. Then pollen tube grows penetrating the style and becomes little flatulent absorbing some liquid. Once the tips of the extended pollen tube entering into the embryo eject two male gametes in the embryo sac. One of them meeting with the egg causes the emergence of a zygote. Another male gamete mixing with the secondary nuclei develop triploid endosperm cells. The two fusions, mixing of a male gamete with an egg and mixing of another male gamete with secondary nuclei, take place at about the same time. This phenomenon is called double fertilization. A zygote is the first cell of a sporophyte. Two cells are produced after its first division. At the same time, flourishing of endosperm is also ignited. A zygote divides transversely. The cell towards the micropyle is called the basal cell and the cell towards the centre of the embryo sac is called the epical cell. Gradually, the apical cell turns into embryo. The suspensor also gets developed concurrently. The process of the formation of fruits begins just immediately after the completion of fertilization. Fertilization ignites stimulation in ovary to make the way of developing fruits steadily ultimately, ovules are turned into seeds.

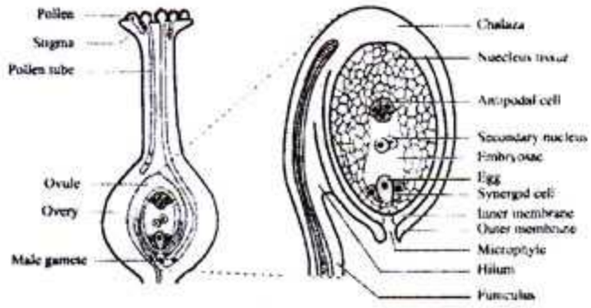
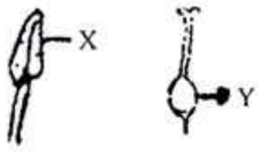


Fig: Fertilization

Ques. ▶ 24



[RAJUK Uttara Model College, Dhaka]

a. What is phytohormone? 1
b. How reflex action occurs. 2
c. Describe the development of a spore which is produced in 'X'. 3
d. Explain the importance of 'Y'. 4

Answer to the question no. 24

a The biochemical substance which is produced in the plant body and regulates growth and development of the plant is called a hormone. A plant hormone is called phytohormone.

b At the time of pricking the dendrites of the sensory neuron, the skin accepts the stimulus. The skin acts as a receptor. This stimulus transmits from the finger to the grey matter of the spinal cord through the axon of the neuron. The relay neurons transmit impulses from the spinal cord to the dendrite of motor neuron. Here impulse is transmitted from the axon 0f the sensory neuron located at the grey matter of the spinal cord to the dendrite of the motor nerve by electrochemical process. So the impulse from the dendrites ultimately reaches the muscle and the muscle contracts (according to the command of the central nervous system). So the hand moves away from the source of the stimulation automatically.

c Fig "X" is the figure of anther in which male gamete is produced. Development male gametophyte is described below —

A pollen is the first cell of a gametophyte. Pollen mother cell (2n) produces four pollen (n) by meiosis. Soon after becoming mature harbouring in the pollen sac starts to germinate. The nucleus of the pollen gets divided through mitotic division and two cells, one large and another small, are formed. The large one is called the tube cell and the small one is called the generative cell. The tube cell turns into the pollen tube and two male gametes are produced. Division of the generative cell takes place in the pollen or pollen tube.

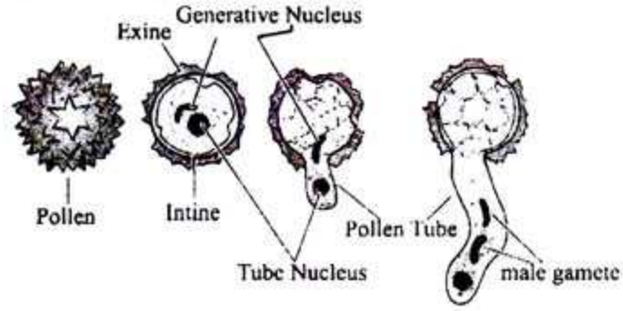


Fig: Development of male gametophyte

d Fig "Y" mentioned in the stem states the fertilization process.The importance of fertilization process is explained below —

The process of fertilization in flowers is immensely important for plants as well as animals that are dependent on them including humans. The direct result of fertilization in flowers is formation of fruits and seeds. The ovary of flower becomes Fruit, ovules inside the ovary become seeds. Therefore without fertilization, there wouldn't be any fruits, pulses, grains, pods & berries in this world. Also there wouldn't be any seeds & nuts formation as well. Plants are able to form their next generation by sexual reproduction only & fertilization is the most significant stage in this process. Fertilization ensures diploid of the organism by fusion of haploid male and female gametes. Fertilization provides new genetic constitution to the zygote. Fertilization process increases the metabolic activities and the rate of protein synthesis of the egg. Fertilization initiates embryogenesis.

Ques. ▶25

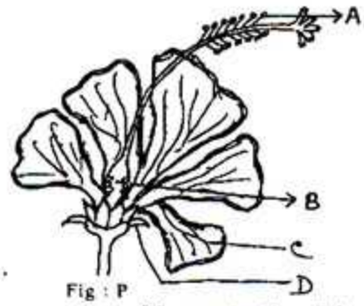


Fig : P

[Viqarunnisa Noon School and College, Dhaka]

a. What is Fertilization? 1
b. Why China-rose is called complete flower? 2
c. Explain C and D lebelled part of the above stem. 3
d. Existence of living world depend on the Fusion of 'A' and 'B'-analyze. 4

Answer to the question no. 25

a Fertilization is the process by which male and female gametes are fused together, initiating the development of a new organism through the formation of zygote.

b China rose is called a complete flower because it contains all whorls of a flower: Thalamus, Calyx, Corolla, Androecium and Gynoecium. Flower that contains all parts is called a complete flower.

c The parts labeled as "C" and "D" of the stem are corolla and calyx of a flower, respectively.

Corolla: It is the outermost-but-one whorl of a flower. They protect the internal parts of a flower from sun and rain. Corolla usually looks colorful. Bright colorful corolla attracts animals, birds, insects etc. and helps in pollination. If the corolla is segmented, each one of it is called a petal.

Calyx: The outermost whorl of a flower is called calyx. Parts of calyx is known as sepal. If the sepals of the calyx are not separated, it is called apposepalous. Green calyx takes part in the production of food. Their main function is to save the inner parts of a flower from the sun, rain and attack of insects and pests. When the calyx is of different colours, it plays important roles in pollination, and it attracts different animals such as insects, birds etc. as the medium of accomplishing pollution.

d The fusion of pollen grain ("A") and ovum ("B") is important for the living world to exist.

The process in which male and female gametes unite to form a zygote is called fertilization. Fertilization of plants is a very important phenomenon, because every other animal of this world is dependent on plants for food, directly or indirectly.

As we know, plants, especially flowering plants are dependent on seeds to continue their reproduction. After fertilization, the fertilized egg slowly converts into seed and the ovary turns into fruit. Matured seed gives rise to new plant after being germinated. The fruits, leaves or seeds of plants are foods for various animals. Again, plants maintain the balance of oxygen and carbon di oxide in the environment.

So, unification of A and B is an important regulator regarding the survival of living world.

Ques. ▶26

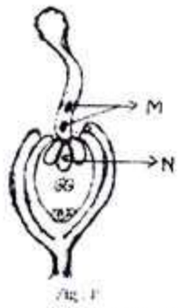


Fig : P

[Ideal School & College, Motijheel, Dhaka]

a. What is known as the manager of the nervous system? 1
b. What is meant by phototropism? 2
c. Explain the formation of 'M' marked part of the above mentioned figure. 3
d. "Fusion of 'M' and 'N' is the main event for producing next generation of the plants."— Analyze this statement. 4

Answer to the question no. 26

a Brain is the manager of the nervous system.

b Phototrophic movement is a kind of movement of curvature. The stem and branches of a plat always move towards light and the root always moves away of light. The movement of stem towards light is called positive phototropism and the movement of root away of light is called negative phototropism.

c The figure M in the stem is a male gamete. A male gamete is formed after pollen is germinated. After being matured, pollen grains start germination inside the pollen sac. The nucleus of pollen grain undergoes mitosis division and generates two dissimilar cells- one is much larger than the other. The larger cell is called tube cell and the smaller is called generative cell. The tube cell turns into pollen tube and division of generative cell gives rise to two male gametes.

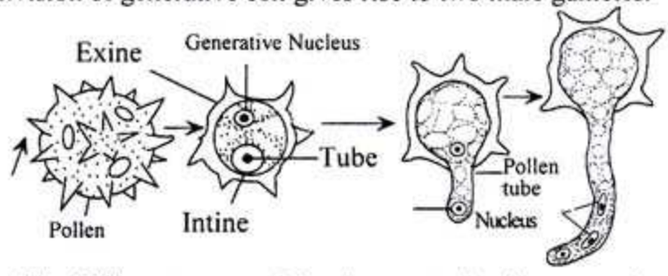


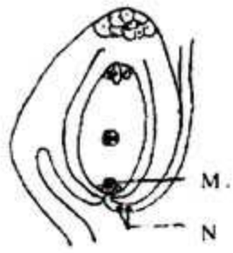
Fig: Different stages of development of male gametophyte

d The figure M and N represents the male gamete and egg of a flowering plant, respectively. The process in which male and female gametes unite to form a zygote is called fertilization. Fertilization of plants is a very important phenomenon, because every other animal of this world is dependent on plants for food, directly or indirectly.

As we know, plants, especially flowering plants are dependent on seeds to continue their reproduction. After fertilization, the fertilized egg slowly converts into seed and the ovary turns into fruit. Matured seed gives rise to new plant after being germinated. The fruits, leaves or seeds of plants are foods for various animals. Again, plants maintain the balance of oxygen and carbon dioxide in the environment.

Thus it is responsible for the formation of next generation of plants.

Ques. ▶27 Look at the figure below and Answer to the questions:



[Milestone College, Dhaka]

a. What is pleura? 1
b. What is meant by osmoregulation? 2
c. Explain the process of formation of 'M' as mentioned in the stem. 3
d. "The union of 'M' and 'N' as mentioned in the stem plays significant role in the alternation of sporophytic and gametophytic stages"-Analyze. 4

Answer to the question no. 27

a The enter surface of the lung is covered by a double layered membrane which is called pleura.

b Osmoregulation is the active regulation of osmotic pressure to maintain the balance of water and electrolytes in an organism. It is the movement of solvent molecules through a semipermeable membrane into an area that has a higher solute concentration. Osmotic pressure is the external pressure needed to prevent the solvent from crossing the membrane.

c "M" mentioned in the stem is known as egg cell especially female gametophyte. The process of formation of female gametophyte is given below-
Near the micropyle being nourished in the nucleus of an ovule, a cell starts to become larger. Its protoplasm is dense and the nucleus is comparatively larger. The cell divides into four haploid cells through meiotic division. Every cell except the smallest one, gets disintegrated. Growing gradually, the larger cell matures into an embryo sac. The nucleus of the cell is haploid. The nuclei are evolved as the nucleus divides. These two nuclei take position in two opposing poles. Next, these two nuclei consecutively divide twice and result in four nuclei.

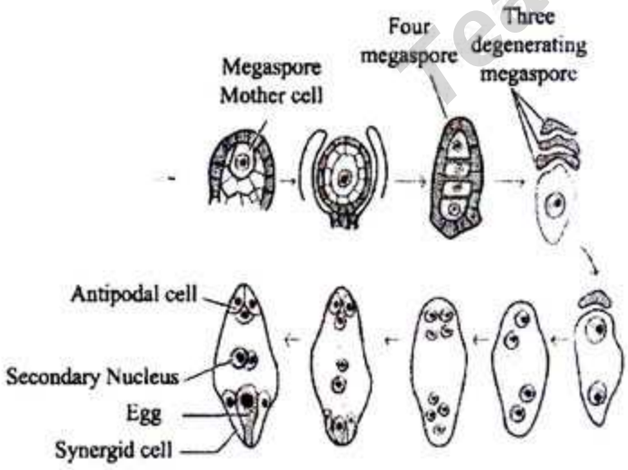


Fig: Formation of female gametophyte.

In the next stage, two nuclei form the two poles coming at the middle of the cell get fused and cause the emergence of two haploid secondary nuclei. The nuclei in the two poles turn into cells with some amount of cytoplasm. Collectively, the combined structure of the three cells near the micropyle is called egg apparatus. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synargid cells. The cells in the opposite pole to the egg apparatus are called antipodal cells. This way the process of developing embryo sac is ultimately done.

d "M" is known as the female gametophyte and "N" is known as the male as male gametophyte. Their union is known as fertilization which plays significant role in the alternation of sporophytic and gametophytic stages. This is analysed below —
Role in the alternation of gametophytic stage –
Through pollination, mature pollen lands on the stigma of a carpel. Then pollen tube grows penetrating the style and becomes little flatulent absorbing some liquid. Once the tips of the extended pollen tube entering into the embryo ejects two male gametes in the embryo sac. One of them meeting with the egg causes the emergence of a zygote. Another male gamete mixing with the secondary nuclei develop triploid endosperm cells. The two fusions, mixing of a male gamete with an egg and mixing of another male gamete with secondary nuclei, take place at about the same time. This phenomenon is called double fertilization.

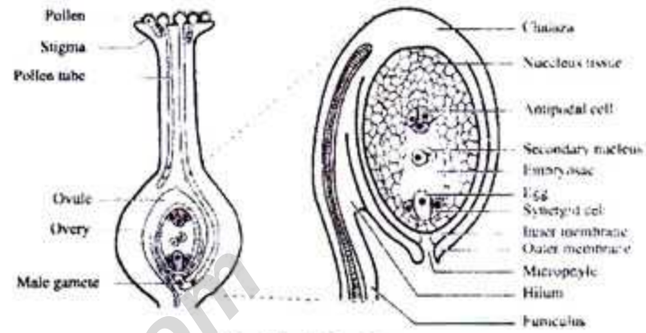
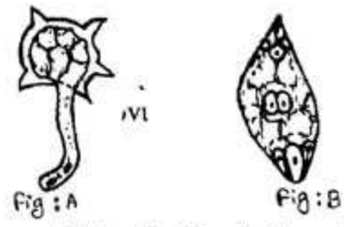


Fig-Fertilization

Role in the alternation of sporophytic stage –
A zygote is the first cell of a sporophyte. Two cells are produced after its first division. At the same time, flourishing of endosperm is also ignited. A zygote divides transversely. The cell towards the micropyle is called the basal cell and the cell towards the centre of the embryo sac is called the epical cell. The division of these two cells continues side by side. Gradually, the apical cell turns into embryo. The suspensor also gets developed concurrently. Cotyledon, radical and plumule are developed one after another and the secondary nuclei start to make the endosperm. The cells in an endosperm are triploid that means they possess three sets of chromosome (3n). At maturity, the ovule with the endosperm and embryo turns into a seed. As the seed germinates, a complete sporophyte is developed.

Ques. ▶28



[Shaheed Bir Uttam Lt. Anwar Girls' College, Dhaka]

a. What is called genetics? 1
b. 'Survival of the fittest'– explain the statement. 2
c. Describe the structure of fig:B with a labeled diagram. 3
d. Analyse the significant role of fig:A & fig:B for the development of a new sporophyte. 4

Answer to the question no. 28

a Genetics is the study of heredity and the variation of inherited characteristics.

b The characters, nature and the trends in organisms and their offspring are the diversity expressing favour and make the organisms to cope up with the environment. These positive characteristics are inherited through generations. Conversely, the organisms, with adverse diversity in the struggling with the passage of time ultimately, are destroyed. Darwin mentioned

that this type of adaption is the first solution to win the struggle against the nature. In the nature, many plants and animals attain some abilities being well adapted. They are suitable in struggling against the nature. In desert, many plants adapt with some striking techniques to store water, introduction of new mummery to protect them. These adoptions are notable components of evolution.

c Fig: B mentioned in the stem is known as female gametophyte. The structure of female gametophyte is described below —

Near the micropyle being nourished in the nucleus of an ovule, a cell starts to become larger. Its protoplasm is dense and the nucleus is comparatively larger. The cell divides into four haploid cells through meiotic division. Every cell except the smallest one, gets disintegrated. Growing gradually, the larger cell matures into an embryo sac. The nucleus of the cell is haploid. The nuclei are evolved as the nucleus divides. These two nuclei take position in two opposing poles. Next, these two nuclei consecutively divide twice and result in four nuclei.

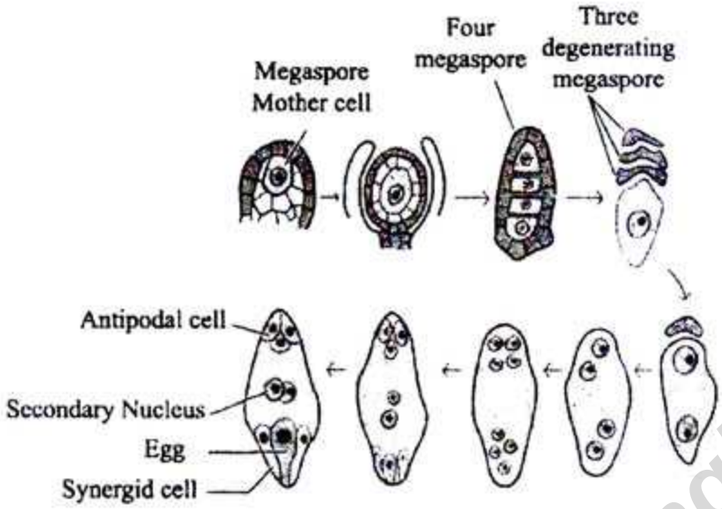


Fig: Structure of female gametophyte

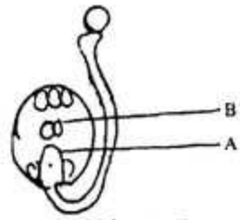
In the next stage, two nuclei form the two poles coming at the middle of the cell get fused and cause the emergence of two haploid secondary nuclei. The nuclei in the two poles turn into cells with some amount of cytoplasm. Collectively, the combined structure of the three cells near the micropyle is called egg apparatus. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synargid cells. The cells in the opposite pole to the egg apparatus are called antipodal cells. This way the process of developing embryo sac is ultimately done

d Fig: A is known as the male gametophyte and fig: B is known as the female as male gametophyte. Their union is known as fertilization which plays significant role for the developement of a sporophyte. This is analyzed below —

Role for the development of new sporophyte –

A zygote is the first cell of a sporophyte. Two cells are produced after its first division. At the same time, flourishing of endosperm is also ignited. A zygote divides transversely. The cell towards the micropyle is called the basal cell and the cell towards the centre of the embryo sac is called the epical cell. The division of these two cells continues side by side. Gradually, the apical cell turns into embryo. The suspensor also gets developed concurrently. Cotyledon, radical and plumule are developed one after another and the secondary nuclei start to make the endosperm. The cells in an endosperm are triploid that means they posses three sets of chromosome (3n). At maturity, the ovule with the endosperm and embryo turns into a seed. As the seed germinates, a complete sporophyte is developed

Ques. ▶29



[Adamjee Cantonment Public School, Dhaka]

a. What is plasmalemma? 1
b. What is meant by infloresence? 2
c. Explain the formation of "A" in above stem. 3
d. Analyze the significance of later condition afterward of "B" part in above stem. 4

Answer to the question no. 29

a Plasmalemma, also known as plasma membrane, is a biological membrane that separates the interior of all cells from the outside environment (the extracellular space).

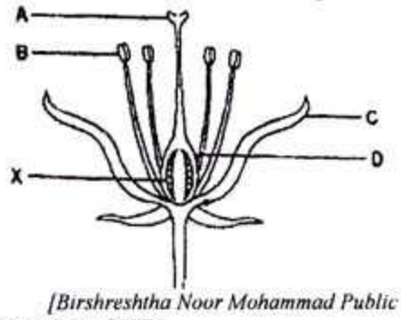
b Inflorescence is the arrangement and organization of flowers on the branch of a tree. On which the flowers are orderly arranged is called peduncle.

c In the stem, a plant female reproductive part is shown where the part A represents an egg. Formation of plant egg is known as megasporogenesis.

Near the micropyle being nourished in the nucellus of an ovule, a cell starts to become larger. Its protoplasm is dense and the nucleus is comparatively larger. The cell divides into four haploid cells through meiotic division. Every cell except the smallest one, gets disintegrated. Growing gradually the larger cell matures into an embryo sac. The nucleus of the cell is haploid. The nuclei are evolved as the nucleus divides. These two nuclei take position in two opposing poles. Next, these two nuclei consecutively divide twice and result in four nuclei. The nuclei in the two poles turn into cells with some amount of cytoplasm. Collectively, the combined structure of the three cells near the micropyle is called the egg apparatus. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synargid cells. Thus, plant egg is formed.

d "B" part of the figure of the stem represents secondary nucleus which are formed by the fusion of two nuclei at the centre of the egg sac. Besides the fertilization of male gamete and egg, a second fertilization may take place when another male gamete fuses with the secondary nucleus. This phenomenon is called double fertilization. The tissue arising from double fertilization is known as endosperm. The cells in an endosperm are triploid, that means they possess three sets of chromosomes (3n). The endosperm plays an important role in supporting the embryonic growth by supplying nutrients and protecting the embryo.

Ques. ▶30 Observe the following diagram:



[Birshreshtha Noor Mohammad Public College, Dhaka]

a. Write the elaboration of HIV. 1
b. What do you mean by placenta? 2
c. Explain the gametophyte formation in X-marked part 3
d. What happens in D-marked part after transferring pollen from B to A? Analyze. 4

Answer to the question no. 30

a Human Immune deficiency Virus is called HIV in short.

b The placenta is a temporary organ that develops in the uterus during pregnancy after 12 weeks of fertilization. This structure provides oxygen and nutrients to the growing baby and removes waste products from the baby's blood. The placenta attaches to the wall of the uterus, and the baby's umbilical cord arises from it. At the time of childbirth, placenta is eliminated from the body. It produces some important hormones. Hormones protect the embryo and help in normal development.

c The X marked part is the ovary. Gametophyte is formed in it in the following way:
Near the micropyle being nourished in the nucellus of an ovule, a cell starts to become larger. Its protoplasm is dense and the nucleus is comparatively larger. The cell divides into four haploid cells through meiotic division. Every cell except the smallest one gets disintegrated. Growing gradually the larger cell matures into an embryo sac. The nucleus of the cell is haploid. The nuclei are evolved as the nucleus divides. These two nuclei take position in two opposing poles. Next, these two nuclei consecutively divide twice and result in four nuclei. In the next stage, two nuclei form the two poles coming at the middle of the cell get fused and cause the emergence of two haploid secondary nuclei. The nuclei in the two poles turn into cells with some amount of cytoplasm. Collectively, the combined structure of the three cells near the micropyle is called egg apparatus. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synergid cells. The cells in the opposite pole to the egg apparatus are called antipodal cells.

d Part A refers to stigma and B refers to anther respectively. When pollen is transferred from anther to stigma in the same flower, it is called self-pollination. The D marked part is the gynoecium. The ovule is formed in the gynoecium. After pollination, the following process occurs:
Pollen is the cell of a gametophyte. Pollen mother cell (2n) produces four pollens (n) by meiosis. Soon after becoming mature, harboring in the pollen sac starts to germinate. The nucleus of the pollen gets divided through mitotic division and two cells, one large and another small, are formed. The large one is called the tube cell and the small one is called the generative cell. The tube cell turns into the pollen tube and two male gametes are produced. Division of the generative cell takes place in the pollen or pollen tube. In ovule, an egg cell is formed in an egg apparatus, which is also collectively called an embryo sac. Embryo sac contains egg cell, synergid cell, and antipodal cell. Through pollination, mature pollen lands on the stigma of a carpel. Then pollen tube grows penetrating the style and becomes little flatulent absorbing some liquid. Once the tips of the extended pollen tube entering into the embryo sac eject two male gametes in the embryo sac. One of them meeting with the egg causes the emergence of a zygote. Another male gamete mixing with the secondary nuclei develops triploid endosperm cells. After fertilization, the ovule becomes seeds, ovary becomes fruit.

Ques. ▶31

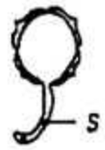


Fig : M

Fig : N

[BAF Shaheen College, Kurmitola, Dhaka]

a. What is Geopreception? 1
b. Explain the use of feromen to control the harmful insects. 2
c. Explain the structure of Figure-N. 3
d. Analyse the significance of later condition after meeting of the 'S' and 'T'. 4

Answer to the question no. 31

a Geoperception is the capacity to cover the sensitive tissue in the root.

b Mating disruption, mass trapping, attract-and-kill, and push-pull are some of the direct pest control strategies that depend on the use of feromens. In the case of weevil pests, feromens are produced by males to attract both males and females and are thus referred to as aggregation feremens.

c Fig- "N" mentioned in the stem is female gametophyte. The structure of female gametophyte is described below-
Near the micropyle being nourished in the nucleus of an ovule, a cell starts to become larger. Its protoplasm is dense and the nucleus is comparatively larger. The cell divides into four haploid cells through meiotic division. Every cell except the smallest one, gets disintegrated. Growing gradually, the larger cell matures into an embryo sac. The nucleus of the cell is haploid. The nuclei are evolved as the nucleus divides. These two nuclei take position in two opposing poles. Next, these two nuclei consecutively divide twice and result in four nuclei.

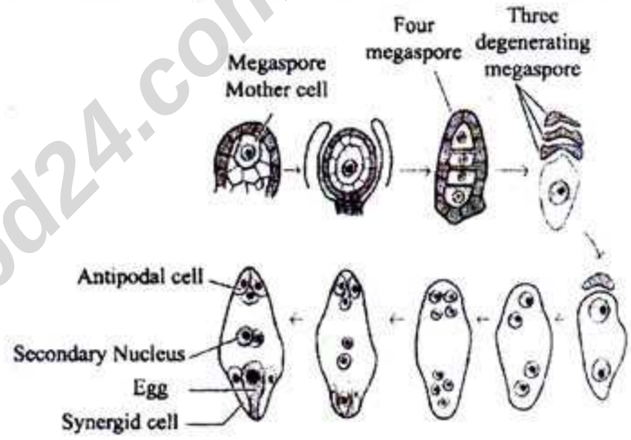


Fig: Formation of female gametophyte

In the next stage, two nuclei form the two poles coming at the middle of the cell get fused and cause the emergence of two haploid secondary nuclei. The nuclei in the two poles turn into cells with some amount of cytoplasm. Collectively, the combined structure of the three cells near the micropyle is called egg apparatus. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synargid cells. The cells in the opposite pole to the egg apparatus are called antipodal cells. This way the process of developing embryo sac is ultimately done.

d Fig- "M" mentioned in the stem is male gametophyte and Fig- "N" mentioned in the stem is female gametophyte. The later condition of after meeting male and female gametophyte is fertilization. The significance of fertilization is analyzed below —
Through pollination, mature pollen lands on the stigma of a carpel. Then pollen tube grows penetrating the style and becomes little flatulent absorbing some liquid. Once the tips of the extended pollen tube entering into the embryo eject two male gametes in the embryo sac. One of them meeting with the egg causes the emergence of a zygote. Another male gamete mixing with the secondary nuclei develops triploid endosperm cells. The two fusions, mixing of a male gamete with an egg and mixing of another male gamete with secondary nuclei, take place at about the same time. This phenomenon is called double fertilization. A zygote is the first cell of a sporophyte.

Two cells are produced after its first division. At the same time, flourishing of endosperm is also ignited. A zygote divides transversely. The cell towards the micropyle is called the basal cell and the cell towards the centre of the embryo sac is called the epical cell. Gradually, the apical cell turns into embryo. The suspensor also gets developed concurrently. The process of the formation of fruits begins just immediately after the completion of fertilization. Fertilization ignites stimulation in ovary to make the way of developing fruits steadily ultimately, ovules are turned into seeds.

Ques. ▶32

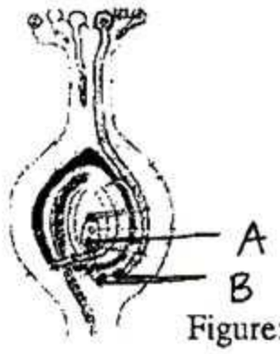


Figure: X

[BIAM Model School and College, Dhaka]

a. What is histology? 1
b. Write the differences betwen self and cross pollination. 2
c. Explain how does A of X diagram is produced. 3
d. What will happen in the plant body in absence of A and B? Analyze. 4

Answer to the question no. 32

a Histology is the branch of biology where the microscopic structure, arrangement and function of plant and animal tissues are studied.

b Difference between self-pollination and cross-pollination is given below,

Feature	Self-pollination	Cross-pollination
Definition	If pollen transfer occurs on the same flower or on the two flowers of the same plant then the type of pollination is called self-pollination.	When the attachment of pollen occurs in between two distinct flowers of the same species, it is called cross-pollination.
Wastage of pollen	Wastage of pollen is less	Large waste of pollen
Carrier dependency	Does not depend on a career for pollination	Carrier dependent process

c 'A' in the stem indicates egg. It develops by the process of Megasporogenesis.
In the nucellus of an ovule, a cell starts to become larger. The cell divides into four haploid cells through meiotic division but only the smallest one divides further. The nuclei are evolved as the nucleus divides. These two nuclei take position in two opposing poles. Next, these two nuclei consecutively divide twice and result in four nuclei. In the next stage, two nuclei form the two poles coming at the middle of the cell get fused and cause the emergence of two haploid secondary nuclei. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synargid cells.

d In the absence of A and B any kind of fertilization is impossible. Because, A and B indicates **egg** and **male gamete** respectively. The two fusions, mixing of a male gamete with an egg and mixing of another male gamete with secondary nuclei, take place at about the same time. This phenomenon is called double fertilization. The process of the formation of fruits begins just immediately after the completion of fertilization. Fertilization ignites stimulation in ovary to make the way of developing fruits steadily and ultimately, ovules are turned into seeds. The ovary after fertilization with the different parts of it turns into a nice structure called fruits. Without fertilization none of these will happen, thus plants will go distinct

Ques. ▶33

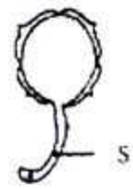


Fig-X

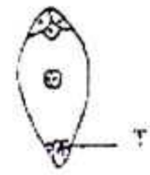


Fig-Y

[Rajshahi Cantonment Public School and College, Rajshahi]

a. What is homologous chromosome? 1
b. What are the symptoms of AIDS? 2
c. Explain the structure of figure 'Y'. 3
d. Explain the later condition of S and T fusion. 4

Answer to the question no. 33

a Homologous chromosomes are chromosome pairs (one from each parent) that are similar in length, gene position, and centromere location

b Symptoms of AIDS are –Rapid loss of body weight, Fever for more than one month for unknown reason, Dry cough for prolonged period.

c In the stem, 'Y' represents megasporogenesis. In the ovule, a cell becomes larger and divides into four haploid cells but only the smallest one divides further and nuclei evolves through nucleus division. The nuclei take position in two opposing poles and consecutively divide twice and result in four nuclei. In the next stage, two nuclei form the two poles coming at the middle of the cell get fused and cause the emergence of two haploid secondary nuclei. The one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synargid cells.

d Fusion of 'S' and 'T' is known as fertilization. After fusion, basal cell and apical cell continues to divide. Gradually, the apical cell turns into embryo. The suspensor also gets developed concurrently. Cotyledon, radicle and plumule are developed one after another and the secondary nuclei start to make the endosperm. At maturity, the ovule with the endosperm and embryo turns into a seed. As the seed germinates, a complete sporophyte is developed. The process of the formation of fruits begins just immediately after the completion of fertilization. The ovary after fertilization with the different parts of it turns into a nice structure called fruits.

Ques. ▶34


Figure-A


Figure-B

[Millennium Scholastic School & College, Bogura]

a. Define implantation. 1
b. Write down the function of placenta. 2
c. Explain the structure of the "A" accordingly. 3
d. Analyze the development of the figure "B" with its impact in plants life. 4

Answer to the question no. 34

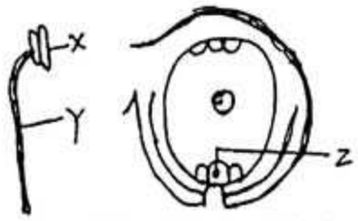
a The process of embedding the blastocyst with the uterine is called implantation.

b The function of the placenta is to form a temporary unseparated organ between the fetus and endoderm of mother's uterus.

c Structure 'A' .represents microsporogenesis. Pollen is the first cell of the gametophyte. Soon after becoming mature harbouring in the pollen sac starts to germinate. The nucleus of the pollen gets divided through mitotic division and two cells, one large and another small, are formed. The large one is called tube cell and the small one is called the generative cell. The tube cell turns into pollen tube and two male gametes are produced. Division of generative cell takes place in the pollen or pollen tube.

d In the stem, 'B' represents megasporogenesis. In the nucellus of an ovule, a cell becomes larger and divides into four haploid cells through meiotic division but only the smallest one divides further. The nuclei are evolved as the nucleus divides. These two nuclei take position in two opposing poles and consecutively divide twice and result in four nuclei. In the next stage, two nuclei form the two poles coming at the middle of the cell get fused and cause the emergence of two haploid secondary nuclei. In between the cells, the one occupying the middle place is the ovum, which is little larger. This is called an egg cell and the other two are called synargid cells. This way the process of developing embryo sac is ultimately done. Male gametes in the embryo sac meet with the egg causes the emergence of a zygote.

Ques. ▶35



[BIAM Laboratory School and College, Bogura]

a. What is the specialty in carbon assimilation pathway that occurs in C_4 plants? 1
b. How does the age of a cell can affect respiration? 2
c. Explain that different conditions of 'Y' are responsible for the variation of Fig 'O'. 3
d. 'Fusion of first gametophyte cell of 'X' with 'Z' can ensure the development of a new saprophyte'-analyze the statement. 4

Answer to the question no. 35

a Carbon assimilation pathway in C_4 plants is known as Hatch-Slack pathway. Here, the first stable compound is a 4-carbon organic molecule, whereas in all other plants the first stable compound is a 3-carbon molecule.

b Young cells of plants contain more amount of protoplasm than old or aged cells. Therefore, young cells are more capable of conducting respiration at a higher efficiency, whereas old cells are worn out and start losing enzymatic activity, which slows down the respiration process.

c Figure O represents an androecium of plant, which is plant's male reproductive organ. A complete part of androecium is named as the stamen. A stamen contains anther at the top and anther is held up by a filament.
Based on the orientation and structure of the filaments, androecium is divided into 5 categories, they are-

1. Monadelphous- Stamens are grouped together around the style of the gynoecium. Example- Chinese hibiscus
2. Diadelphous- Filaments are attached in two groups
3. Polyadelphous– Filaments are attached in more than two groups. Example-cotton tree
4. Syngensious –When stamens are fused together
5. Epipetalous- stamens are inserted in the petals (corolla).

d The figure Z represents a female ovule.
The fusion of male and female gametes produces a diploid zygote which develops into a new sporophyte. The gynoecium is composed of one carpel consisting of an ovary, a stigma, and a style. In ovule, an egg cell is formed in an egg apparatus, which is also collectively called an embryo sac. Embryo sac contains egg cell, synergid cell and antipodal cell. Through pollination, mature pollen lands on the stigma of a carpel. Then pollen tube grows penetrating the style and becomes little flatulent absorbing some liquid. Once the tips of the extended pollen tube entering into the embryo sac eject two male gametes in the embryo sac, one of them meeting with the egg causes the emergence of a zygote. Another male gamete mixing with the secondary nuclei develops triploid endosperm cells. After fertilization, the ovule becomes seeds, ovary becomes fruit. A zygote divides transversely. The cell towards the micropyle is called the basal cell and the cell towards the center of the embryo sac is called the apical cell. The division of these two cells continues side by side. Gradually, the apical cell turns into an embryo. The suspensor also gets developed concurrently. Cotyledon, radicle, and plumule are developed one after another and the secondary nuclei start to make the endosperm (3n). Thus a new sporophyte is formed again.

Ques. ▶36 Cross Pollination

[Sirajganj Collectorate School and College, Sirajganj]

a. What is flower? 1
b. What do y ou mean by inflorescence? 2
c. What is called the process of figure? Explain it. 3
d. What problems will be create in environment when mentioned process will not happen. Give your opinion. 4

Answer to the question no. 36

a The flower is a modified shoot specially adapted for sexual reproduction by plants.

b The mode of arrangement of a collection number of flowers on the branch or branch system is known as inflorescence. The branch on which a collection of flowers develop is known as the peduncle. There are two principal types of inflorescence– (i) Racemose and (ii) Cymose. In the racemose type of inflorescence indefinite number of flowers are developed and in the cymose inflorescence number of flowers is limited.

c The process shown in the figure of the stem is the cross pollination of flowers.
Cross pollination is the process when pollination takes place between the flowers of different plants of same species
The process shown in the stem is the cross pollination. For cross pollination different pollinating agents are required. In most of the cases, a medium or cues accomplishes the transfer of pollen. The carrier, which carries pollen, is called pollen courier. Air, water, insects and flies, birds, vampires, snails and even men may be the media of pollination. To consume nectar from a flower or after fallen in love with the charming colour of the flower, the carriers loiter from one flower to another. Then pollens get attached to the carrier at that time when the carrier sits on the lap of the flower causing the pollen get attached with it.
So, the process is therefore a cross pollination.

d In the figure of the stem, cross pollination has been shown. Without this process, a lot of problems will be created in the environment.
As a result of cross pollination, new characteristics are created, the rate of seed germination becomes high, the viability of seeds increases, plants become more tolerable to

unfavorable condition and ultimately new species are developed. As new characters accumulate in the cross pollinated plants, it gives rise to new varieties. Thus the plants produced in cross pollination can tolerate different changed environment and grow normally in the changed environment.
Without cross pollination addition of new characters does not take place in the progeny and the new variety is not produced. Thus the plants become unable to grow in changed or diversified environment. For this reason, there have some chance for the extinction of the species in the changed environment.
So, from the above discussion, it can be clearly concluded that without cross pollination, the balance of environment will be lost and the plants and animals may extinct.

Ques. ▶37 Bringing rotten cow dug, rotten leaves and branches mixed soil from village Mr. Shahed sowed pumpki, bean , tomato etc. seed in tub on his house roof. Plantlet raised from seed than matured plant from plantlet and when flowers bloomed one day he went to roof with his daughter. Seeing been flowers his daughter said, See father, many ants are running to and fro on the flower. Ants and plants both becomes benefitted by this Mr. Shahed replied his daughter.

[The Millennium Stars School and College, Rangpur]

a. What is scavenger? 1
b. Why mineral salts are required for sound health? 2
c. What type of relation is present in between ant and bean flower in stem? Explain. 3
d. How ovary of bean flower changed after movement of ant? Analyze. 4

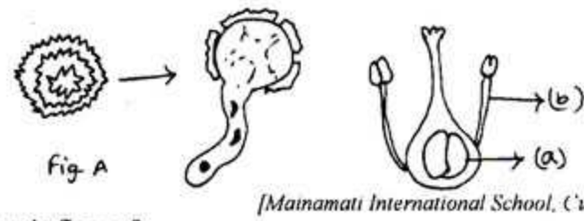
Answer to the question no. 37

a **Scavenger:** Scavengers are living organisms of a food chain, which removes the dead life forms by up taking them as food. For example Crow.
bb **The necessity of mineral salts for sound health:** Mineral salts are essential for body cells and body fluid. The human body contains mineral salts, such as calcium, iron, sulphur, zinc, sodium, potassium, iodine etc. These ingredients do not exist as an element. These elements remain within the food and human body as a compound with other elements. Combines with others elements and forms various organic and inorganic salts. Mineral salts regulate bodybuilding and internal functions. Mineral salts are the most essential elements in the formation of teeth, muscles, enzyme and hormones. It has a particular role in nerve impulses, muscle contraction, maintains water balance in body cells, balancing of acid and base etc.

c Ants and bean plants maintain a mutualistic relationship between them.
The relationship is mutualism when in the association both the organisms become benefited. Such as bee, fly, worm and insect etc. move around from flower to flower to attain the nectar and as a result the pollination is accomplished.
Here ants get nutrition source from the flowers and during this, they promote pollination of the bean plants. That is how they both become benefited from this association.

d **Change in bean ovary:** Trough pollination, mature pollen lands on the stigma of a carpel. Then pollen tube grows penetrating the style and becomes little flatulent absorbing some liquid. Once the tips of the extended pollen tube entering into the embryo eject two male gametes in the embryo sac. One of them meeting with the egg causes the emergence of a zygote. Another male gamete mixing with the secondary nuclei develops triploid endosperm cells. The two fusions, mixing of a male gamete with an egg and mixing of another male gamete with secondary nuclei, take place at about the same time. This phenomenon is called double fertilization.
Development of new sporophyte: A zygote is the first cell of a sporophyte. Two cells are produced after its first division. At the same time, flourishing of the endosperm is also ignited. A zygote divides transversely. The cell towards the micropyle is called the basal cell and the cell towards the centre of the embryo sac is called the apical cell. The division of these two cells continues side by side. Gradually, the apical cell turns into an embryo. The suspensor also gets developed concurrently. Cotyledon, radicle, and plumule are developed one after another and the secondary nuclei start to make the endosperm. The cells in an endosperm are triploid that means they possess three sets of the chromosome (3n). At maturity, the ovule with the endosperm and embryo turns into a seed. As the seed germinates, a complete sporophyte is developed. So it has been found that sporophyte and gametophyte, two states run in a repeating way one after another through the life cycle of a flowering plant.

Ques. ▶38



[Mainamati International School, Cumilla]

a. What is flower? 1
b. What is double fertilization? 2
c. Explain the above mentioned process. 3
d. Analyze the importance of part (a) and (b) in reproduction. 4

Answer to the question no. 38

a **Flower:** A flower is a special type of modified shoot which is the reproductive organ of higher plants.

b **Double fertilization:** The two fusions, mixing of a male gamete with an egg and mixing of another male gamete with secondary nuclei, take place at about the same time. This phenomenon is called double fertilization.

c Figure 'A' indicates the development of male gametes or microsporogenesis.
Microsporogenesis: A pollen is the first cell of the gametophyte. Soon after becoming mature harbouring in the pollen sac starts to germinate. The nucleus of the pollen gets divided through mitotic division and two cells, one large and another small, are formed. The large one is called tube cell and the small one is called generative cell. The tube cell turns into pollen tube and two male gametes are produced. Division of generative cell takes place in the pollen or pollen tube.

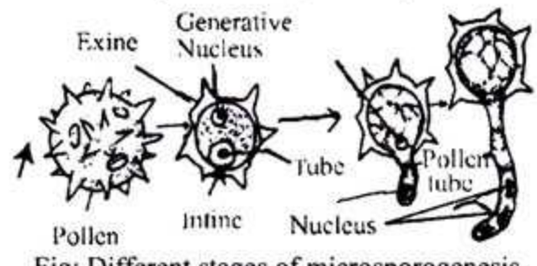


Fig: Different stages of microsporogenesis.

d Part (a) and (b) represents androecium and gynoecium. Their importance in reproduction is given below:
Androecium: It is the third whorl from outside of a flower, and it is an essential whorl. Every part of an androecia is called stamen. In an androecium, there may be one or more stamens. The stalk-like the structure of stamen is called the filament and a sac-like apical structure of it is called anther. The part of a stamen, which connects the anther to the filament, is called connective. Pollens are developed in an anther. A pollen tube is produced from a pollen after germination. Thus, pollen male gamete is produced in the pollen tube. The male gametes directly take part in the process reproduction.

Gynoecium: The portion of gynoecium is at the center of a flower. It is another essential whorl of a flower. A gynoecium may be structured with one or more carpels. A carpel has three parts, such as ovary, style, and stigma. One or more ovules are there in a flower in accordance with some orders arranged inside of an ovary. Within the ovule, female reproductive cell ovum is produced. This ovum like an androecium directly gets involved in the process reproduction.

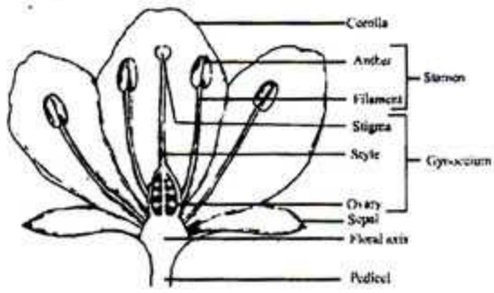


Fig: Androecium and gynoecium of flower

Ques. ▶39

[Chattogram Cantonment Public College, Chattogram]

a. What is electron microscope? 1
b. Sporophyte and gametophyte, two states run in a repeating way one after another through the life cycle of a flowering plant– Explain. 2
c. How the part 'B' is formed by developing the part 'A'? Explain. 3
d. Analyze the role of hormone in the process shown above. 4

Answer to the question no. 39

a The electron microscope is a type of microscope that uses a beam of electrons to create an image of the specimen.

b A flowering plant reproduces through sexual reproduction method, where male and female germ cells undergo meiosis cell division. In this way diploid (2n) germ cells produce haploid(n) gametes; sperm in androecium and egg in gynoecium; this is the gametophyte stage. During sexual reproduction, sperm and egg cell fuse to form zygote which later develops into a plant; this is sporophyte stage. Thus, the diploid state comes back.

c Fusion of ovum and sperm gives rise to zygote which later undergoes continuous mitosis cell division and develops into an embryo. Later, the embryo fully develops into a newborn baby. The developmental stages are listed below —

- Immediately after fertilization, the zygote begins mitosis division named as cleavage. At the last stage of cleavage, growing embryo arrives in the uterus and it is named as blastocyst.
- Blastocyst adheres to uterine wall and forms a tissue called placenta. This stage is known as placentation. Formation of placenta is very important as the growing fetus gets nutrition from mother through placenta.
- It takes on an average of 40 weeks for a human baby to be fully developed inside the mother.
- After birth, the baby grows into a child, then face adolescence period and later matures into an adult in his lifespan.

d Hormones play important role in every stage of life in the following ways —

- Testosterone helps in sperm production and estrogen produces ovum. Other sex hormones help develop male and female sexual organs an to express individual characteristics.
- Placental gonadotropic and progesterone hormones help to produce milk and easy childbirth.
- Hormone helps in labor which means childbirth.
- Growth stimulating hormones regulate growth of an individual.
- Thyroid hormones (Thyroxine) help regulate metabolic function for physical and mental development.

Ques. ▶40 Sperm + Ovum → Zygote → Expansion.

[Cantonment English School and College, Chattogram]

a. What is puberty? 1
b. What are embryonic membranes? 2
c. Show the stages as mentioned in the stem. 3
d. Analyze the flow chart of the stem. 4

Answer to the question no. 40

a Puberty the period during which adolescents reach sexual maturity and become capable of reproduction.

b The embryos of each species have a series of embryonic membrane which are essential for easy, normal and safe development of the embryo. These help in fetus nutrition, gaseous exchange and elimination of waste products. Embryonic membrane protects the embryo and controls other important action.

c

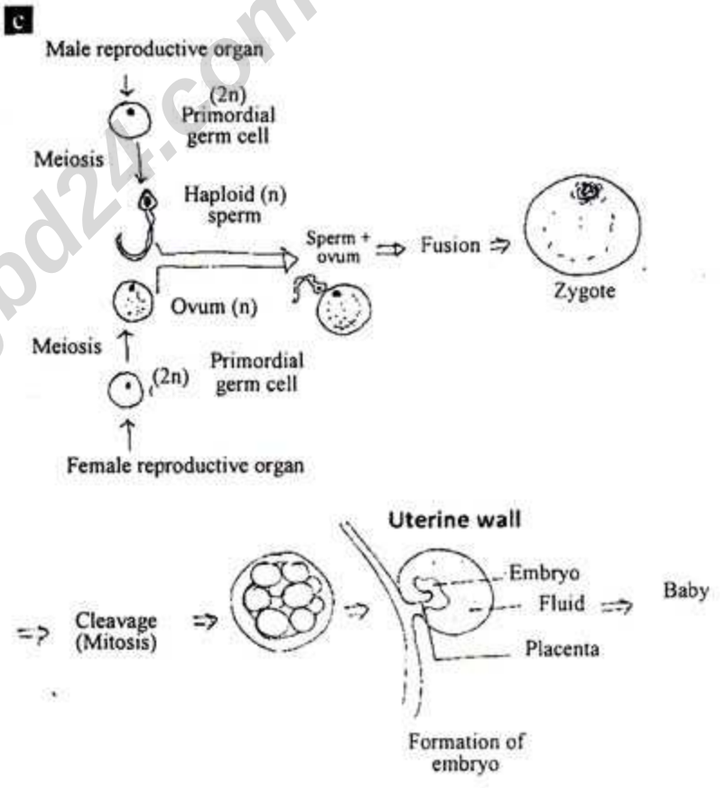


Fig: Stages of embryonic development

d The uterus, also commonly known as the womb, is a hollow muscular organ of the female reproductive system that is responsible for the development of the zygote into a baby. The uterus is the part of the pathway for the sperm to reach the ovum. It is also responsible for menstruation, the implantation of the zygote, the development of the fetus then the labour. The uterus is lined with mucous membrane rich in the blood capillaries to form placenta which responsible for the nourishment of the fetus during the pregnancy through the umbilical cord. Ovum or egg is formed in the ovary and following fertilization, the egg gradually passes along the oviduct to the uterus and cell division starts happening (cleavage stage). At the last stage of cleavage, a mass of cells of the growing embryo is formed into blastocyst. For the

development of next stage of blastocyst. The embryo has to be embedded in the inner wall of the uterus. So, the blastocyst becomes embedded with the uterine wall, this process is called implantation or conception. Embedded with uterus the embryo grows and turns into a human fetus. Time between the implantation and childbirth is called pregnancy. This is how fertilisation leads to the formation of zygote and later through mitosis division, the embryo grows into a fully-grown organism.

Ques. ▶41 A — Calyx Corolla
B — Androecium
C — Gynoecium

[Cantonment English School and College, Chattogram]

a. What is inflorescence? 1
b. Why are B and C essential whorls? 2
c. Distinguish B from C. 3
d. How does C serve its own species explain. 4

Answer to the question no. 41

a A small branch with flowers arranged in a special order is called inflorescence.

b Androecium and gynoecium are called the essential whorls of a flower because these two are directly associated with plant's reproduction system. Male gamete and female gamete are produced in androecium and gynoecium, respectively which upon pollination, follow fertilisation and then create new plant embryo. The other whorls of plant take part in protecting the essential whorls and indirectly or directly helps in pollination.

c Androecium: It is an essential whorl of flower. Every part of an androecium is called stamen. One more stamen is present in androecium. Stamen has two parts- filament which is a long stalk like structure and anther which is a sac like structure where pollen grains are produced. Pollen grains convert into male gamete when the plant is ready for reproduction.
Gynoecium: The portion of gynoecium is at the center of a flower. It is an essential whorl of a flower. A gynoecium may be structured with one or more carpels. A carpel has three parts- ovary, style and stigma. There is one or more ovule in a flower. Within the ovule, female reproductive cell ovum is produced. This ovum directly gets involved in the process of reproduction. Different parts of the gynoecium transform into different parts of fruits following fertilisation.

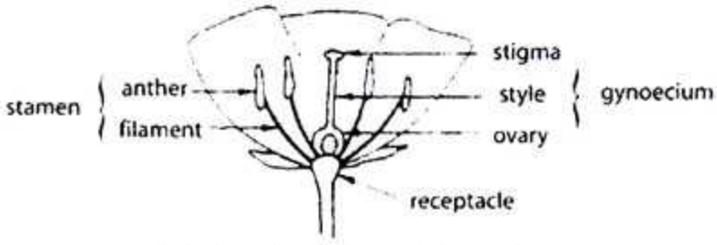
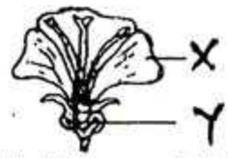


Fig: Essential whorls of a flower

d Gynoecium is an essential whorl of a flower. There is ovule present in the gynoecium. Within the ovule, female reproductive cell ovum is produced. This ovum like an androecium directly gets involved in the process reproduction. In the ovum there exists female gamete. After pollination female gamete mixing with a male gamete produces zygote. Another male gamete mixing with the secondary nuclei develop triploid cells. Because of this fertilized gynoecium and fertilized ovum, we get seeds and from seeds we get plants. In this way part Q in the stem serves its own species.

Ques. ▶42



[Jalalabad Cantonment Public School and College, Sylhet]

a. What is Zygote? 1
b. Why hormone is known as chemical meassenger? 2
c. How does the part-X paly role in pollination – explain. 3
d. From X and Y which one is more important for reproduction – Analyze. 4

Answer to the Question no. 42

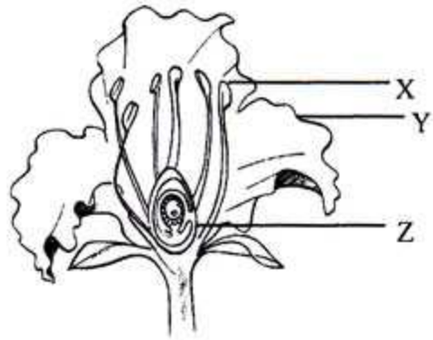
a Zygote is the first cell produced after the union of male and female gamete cells.

b Hormone acts as a chemical messenger and is transported all over the body organs through blood, helps in chemical reaction and controls different metabolic and physiological processes. A particular hormone secretes in small amount yet is controls different physiological process.

c The part X is called corolla. It plays role in pollination in the following way:
Corolla is the outermost-but-one whorl of a flower. If the corolla is segmented, each one of it is then called a petal. If the petals in a corolla are separate from each other, the term polypetalous is used then. In case of having sepals wholly or partially fused, they are called gamopetalous. Corolla usually looks colorful. They protect the internal parts of a flower from the sun and rain. Bright colorful corolla attracts animals – birds, insects etc. and helps pollination. Sometimes insects draw nectar sitting on the corolla of a flower. The purpose of pollination is served when the carriers complete these activities.

d In the figure, X is called corolla and Y is called ovary. Among the two of them, Y is more important for reproduction. Ovary is the part of gynoecium which takes part in fertilization with the androecium. We know that fertilization is the precondition for sexual reproduction. Fertilization takes place by the union of the male and female gametes.
The male gametes develop from the microspores produced within one another. On the other hand the female gamete or ovum or egg is produced inside the ovule developed within the ovary. After pollination, the pollen tube penetrates the tissue of the stigma and ovary and then releases the gametes in the embryo sac of the ovule. Within the embryo sac one of the two male gametes released from the pollen tube come in contact of the egg or ovum. The union of male and female gametes is known as fertilization. The fertilized egg is converted into zygote. The zygote develops into the embryo which grows into a new plant. Thus the sexual reproduction of plants is completed.

Ques. ▶43 Answer the questions based on the following stem.



[SCHOLARSHOME, Sylhet]

a. What is lymph? 1
b. Explain what is hormone. 2
c. Explain the roles of 'Z' in a plant shown in above figure. 3
d. "X" and "Y" directly take part in reproduction-Analyse the statement. 4

Answer to the question no. 43

a Lymph is the fluid circulating through the lymphatic system.

b There is a special kind of gland in certain animals and in humans. The chemical substance secreted from these glands and are carried by the blood and control various physiological processes. The secretions produced by the ductless glands or endocrine glands are known as hormones.

c "Z" mentioned in the stem is corolla which is a part of a flower. Role of corolla is explained below —

Corolla is the outermost but one whorl of a flower. If the corolla is segmented, each segment is then called a petal. If the petals in a corolla are separate from each other, the term polypetalous is used then. In case of having sepals wholly or partially fused, they are called gamopetalous. Corolla are usually colorful. They protect the internal parts of a flower from the sun and rain. Bright colorful corolla attract animals - birds, insects etc., and helps pollination. Sometimes insects draw nectar from the corolla of a flower. The purpose of pollination is served when the carriers complete these activities.

d Fig "X" is the figure of anther in which male gamete is produced and Fig "Y" is the figure of ovary in which female gamete is produced. Both of the directly take part in reproduction. This is called fertilization. This is analyzed below —

Through pollination, mature pollen lands on the stigma of a carpel. Then pollen tube grows penetrating the style and becomes little flatulent absorbing some liquid. Once the tips of the extended pollen tube entering into the embryo ejects two male gametes in the embryo sac.

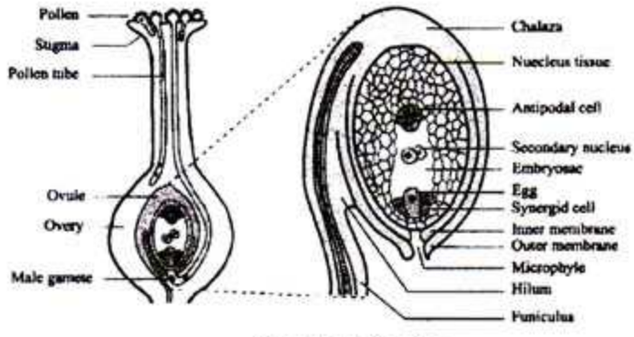
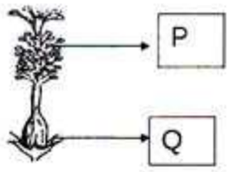


Fig: Fertilization

One of them meeting with the egg causes the emergence of a zygote. Another male gamete mixing with the secondary nuclei develop triploid endosperm cells. The two fusions, mixing of a male gamete with an egg and mixing of another male gamete with secondary nuclei, take place at about the same time. This phenomenon is called double fertilization.

Ques. ▶44 Pay heed to the figure and answer the following questions:



[Jashore English School & College (JESC), Jashore]

a. What is hormone? 1
b. What is self pollination? 2
c. Explain what problems there will be in pollination if the part P in the stem is absent. 3
d. Express your opinions, how does the part Q in the stem serve its own species? 4

Answer to the question no. 44

a The secretions produced by the ductless glands or endocrine glands are known as hormone.

b If transfer of pollen occurs on the same flower or on the two flowers of the same plant, then the pollination is called self-pollination. For example, pollination in Brassica.

c Part P in the stem is androecium. It is an essential whorl of any flower.

Every part of an androecia is called stamen. The stalk like structure of stamen is called the filament and a sac like apical structure of it is called anther. The part of a stamen, which connects the anther to the filament, is called connective. Pollens are developed in an anther. A pollen tube is produced from a pollen after germination. Thus, pollen male gamete is produced in the pollen tube. The male gametes directly take part in the process reproduction. So, without androecium pollination will never take place.

d Part Q in the stem indicates calyx of a flower. It is one of the basic five parts of a flower.

Each of the part of calyx is called a sepal. The green calyx takes part in the production of food. Their main function is to save the inner parts of a flower from the sun, rain and attack of insects and pests. When the calyx is of different colours, it plays important roles in pollination, and it attracts different animals such as insects, birds etc. as the medium of accomplishing pollution. Thus, calyx is a significant part of any flower.