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B.Sc HONS Part-III Paper - VI

TOPIC:- Give an account of Gametogenesis.

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Q. B. Give an account of Gametogenesis.

Ans. Introduction : Sexual reproduction is an important process in the living beings. This reproductive power is performed by certain specialized cells produced in the gonads called gonial cells. These cells, a result of division, from sex cells or gametes by the union of which sexual reproduction is affected. The process by which gametes are produced in the gonads is called gametogenesis. The gametes produced in the case of male reproductive organs (testis) are called spermatids, and in the case of female reproductive organs (ovaries) ootids. The formation of spermatids or male gametes is called spermatogenesis. Similarly the formation of ova is called oogenesis. Both the processes are quite complicated as the gonial cells are diploid containing double number of chromosomes while gametes produced by these cells are haploid containing half the number of chromosomes to the mother cell. The reduction (haploids) of chromosome number from diploid cell constitute the process of meiosis.

(A) Spermatogenesis : It is a complicated process which occurs in the testis of animals. It is performed in two stages, in the first stage spermatids are produced as a result of meiosis, and in the second stage there occurs metamorphosis in spermatids and spermatozoa are formed. The process of formations of sperms from spermatids is called spermatoleosis or spermiogenesis.

1. Formation of spermatids : The spermatids are produced the diploid cells of testis called spermatogonial cells. The whole process occurs in three stages as follows—

(a) Multiplication phase : The testis are composed of seminiferous tubules lined by germinal cell. Some of the germinal cells become modified for spermatogenesis and are called as primary germ cells, while other cells serve nutrition for above cells and may be called as sertoli cells in the case of mammals. The primary germinal cells divided mitotically several times to produce a large number of spermatogonial cells.

Each spermatogonium is diploid and before entering upon the next phase it ceases to divide.

(b) Growth phase : As the division stops each spermatogonium becomes enlarged in size by absorbing nutrients forms germinal cells. These cells are now called as the primary spermatocyte cells. The nucleus of a primary spermatocyte is of ordinary size in beginning but it grows and becomes much larger than the nucleus of the spermatogonial cell. During growth period pairing and splitting of chromosomes takes place resulted in the formation of tetrads crossing over also becomes completed in this phase which may represent prophase I of meiotic division.

(c) Maturation phase : During this period, firstly two cells are produced which are haploid as a result of meiosis. At the completion of growth phase tetrads line up in the middle representing metaphase stage. It is followed by anaphase and telophase, resulting division of primary spermatocyte into haploid cells containing dyads called secondary spermatocytes. Collectively they are called anaxocytes. During second maturation division mitosis takes place in the secondary spermatocyte thus each giving rise to two spermatids, each spermatid is single and it undergoes metamorphosis to change into spermatozoan.

Oogenesis : The production and development of ova from the primordial germ cells is known as Oogenesis. This process consists of three phases i.e., multiplication, growth and maturation.

(i) Multiplication : After attaining sexual maturity, the primordial germ cells which line the ovary undergo repeated mitotic division to produce a large number of clusters of Oogonial cells. They are also known as egg mother cells. The Oogonium produced as a primary Oocyte. This possesses diploid set of Chromosomes.

(ii) Growth : On reaching sexual maturity the primary oocyte creases enormously in its size. This enormous growth in size involves two processes namely (a) previtellogenesis (b) vitellogenesis.

(a) Previtellogenesis : A remarkable growth in the size, ultimately in the volume of both the nucleus as well as Cytoplasmic content is known as previtellogenesis.

The nucleus undergoes certain changes. A large amount of nuclear sap is synthesized. Nucleolus proliferates, a considerable amount of r-RNA are produced by the nucleolus. Chromosomes enter the Zygotene phase of meiosis. These changes enlarge the size of nucleus and enlarged nucleus is known as germinal vesicle.

The Cytoplasmic contents grow due to increase in number of mitochondria, endoplasmic reticulum assumes the form of parallel bundles and Golgi Complex acquire the form of spherical mass.

(b) Vitellogenesis : In order to supply the nutrient materials to the developing embryo, the Oocyte synthesises and stores food material in the form of granules and platelets of yolk. The process of synthesis and deposition of the yolk is known as vitellogenesis.

(iii) Maturation : Initiation of the meiotic division marks the beginning of the multiplication phase. The conversion of the fully grown primary Oocyte into an ovum by unequal division is known as maturation.

The primary Oocyte undergoes first meiotic division which is unequal in nature—small cell, first polar body and large cell, secondary oocyte.

The secondary oocyte undergoes second meiotic division. It is also of unequal type and produced a small second polar body and a big ovum. The polar bodies have no functions to perform after completion of maturation, so these disintegrate.

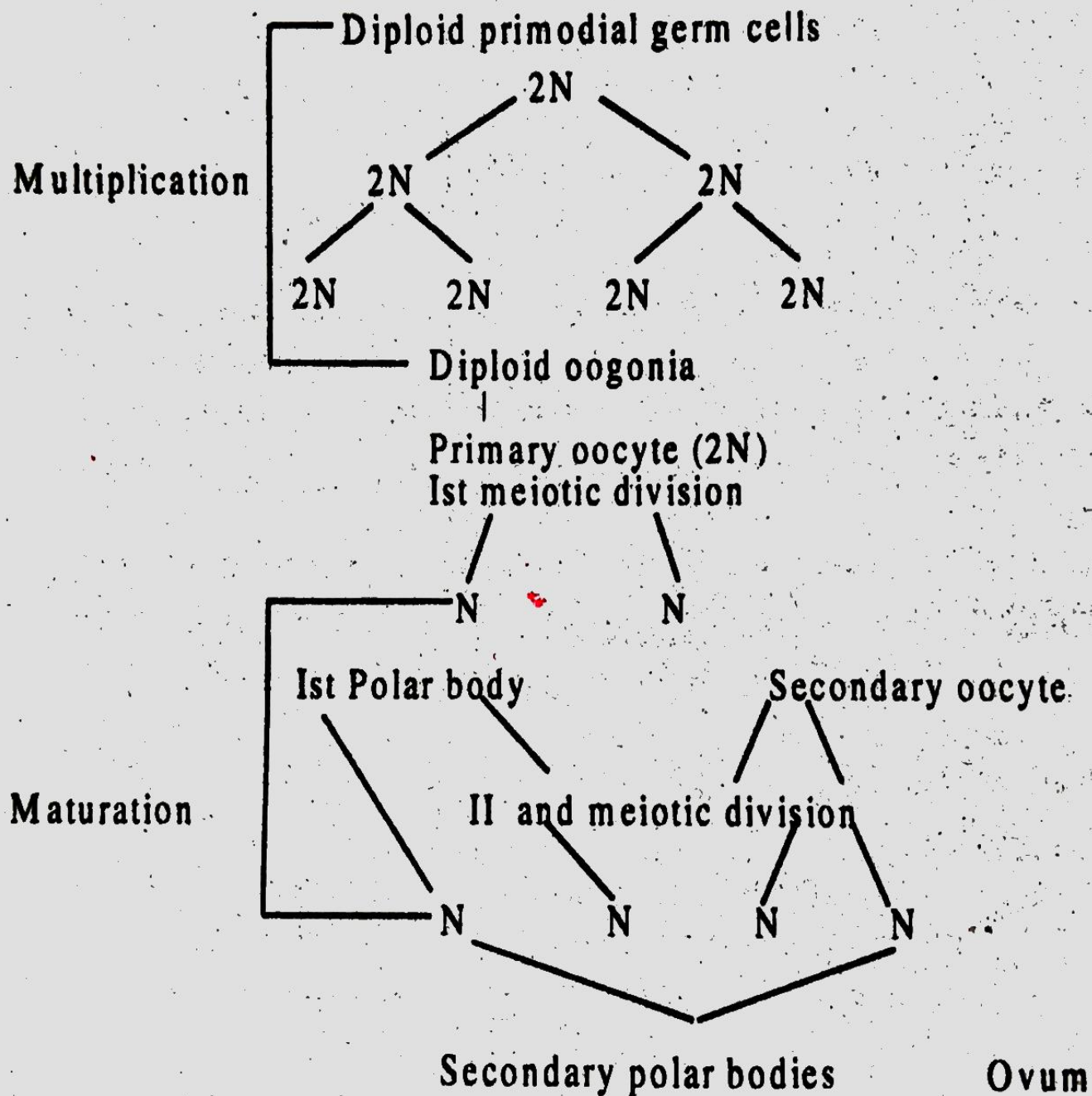


Fig. Events in oogenesis