

# Difference Between Meiosis and Gametogenesis

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## Key Difference - Meiosis vs Gametogenesis

Meiosis is a type of [cell division](#) that occurs during the [sexual reproduction](#) for sex cell formation. During meiosis, the [chromosome](#) number is reduced by half to maintain the chromosome number in the [zygote](#). The male and female chromosomes segregate and then divide into the successive generation. There are two main phases of meiosis namely [meiosis I and meiosis II](#). Similar to mitosis, meiosis is also comprised of the stages known as [prophase](#), [metaphase](#), [anaphase](#), and [telophase](#). At the end of the meiotic cell division, four daughter cells are formed with a [haploid](#) number of chromosomes. Gametogenesis is the process that forms [gametes](#) for sexual reproduction. Meiosis is required for gametogenesis. The **key difference** between meiosis and gametogenesis is, **meiosis is a cell division process while gametogenesis is a process of gamete formation.**

## What is Meiosis?

Meiosis is the type of cell division process that produces haploid cells from diploid parent cells. From the single diploid cell, four haploid cells are produced by meiosis. Meiosis occurs during the sexual reproduction. Gamete or the sex cell formation is the purpose of meiosis happens in the sex organs. Meiosis has two complete cell division cycles; Meiosis I and Meiosis II. Hence it results in four daughter cells which contain half of the genetic material of the parental cells. In each meiosis, there are four phases; prophase, metaphase, anaphase, and telophase. Altogether there are eight phases in the meiotic cell division.

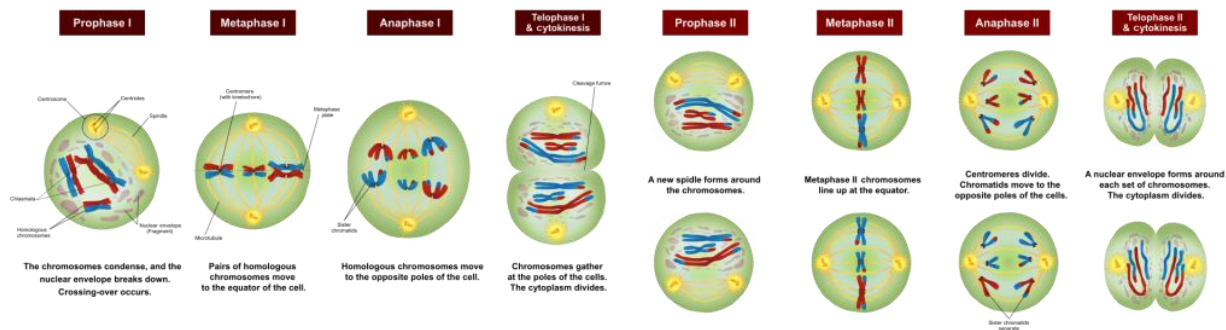


Figure 01: Meiosis

During the meiotic prophase, bivalents are formed, and the genetic composition is mixed at points known as the chiasma. Bivalent or tetrad is an association of [homologous chromosomes](#) formed during the prophase I of meiosis. Chiasma is the contact point where two homologous chromosomes form a physical connection or a [crossing over](#). Crossing over results genetic material mixing between homologous chromosomes. Therefore the resulting gametes will obtain new gene combinations showing the genetic variability among the offsprings.

## What is Gametogenesis?

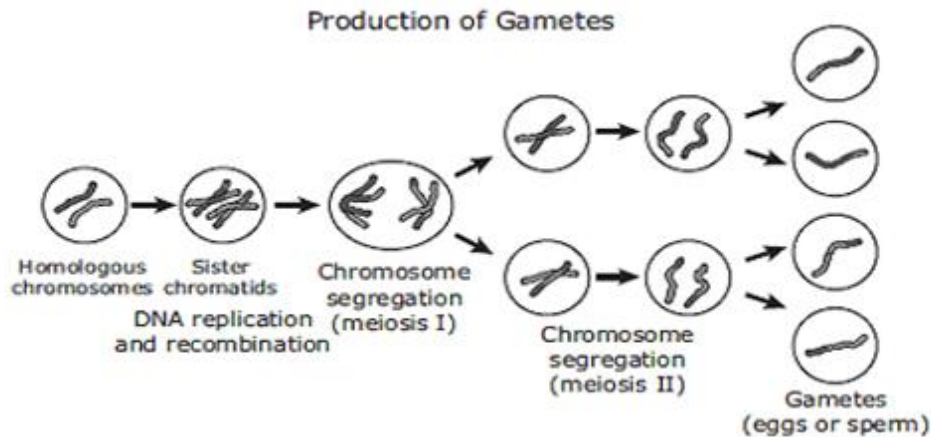
During sexual reproduction, gametes are formed by gametogenesis. In humans, two types of gametes are produced. They are female gametes (eggs) and male gametes (sperms). The gametes unite to form a zygote through [fertilization](#). It is an important aspect in the context of reproduction. Gametogenesis is of two types, male gametogenesis([spermatogenesis](#)) and female gametogenesis (oogenesis). Spermatogenesis and oogenesis takes place in the gonads; testis and ovaries respectively. Both processes complete three stages; multiplication, growth and maturation. Gametogenesis involves meiosis where both spermatogenesis and oogenesis produce two sets of haploid (n) chromosomes.

Spermatogenesis is the process that produces male gametes; sperms. This process takes place in the [epithelial cells](#) of the seminiferous tubules. The seminiferous tubules are structures present in the testis. Initially, mitosis takes place in the epithelium where rapid cell division leads to the formation many spermatogonia which then develops into diploid (2n) primary spermatocyte. The primary spermatocyte undergoes the first stage meiosis (meiosis I) which results in haploid (n) secondary spermatocytes. Each primary spermatocyte gives rise to two secondary spermatocytes. The secondary spermatocytes complete meiosis II that results in the formation of 04 spermatids from each secondary spermatocyte. The spermatids give rise to mature sperms. The process is regulated by the [hypothalamus](#) and [anterior pituitary](#). The hypothalamus secretes GnRH (gonadotrophin releasing hormone) that stimulates the anterior pituitary to release follicle stimulating hormone ([FSH](#)) and Luteinizing hormone ([LH](#)). Both hormones involve in the development and maturation of sperms.

LH also stimulates the production of testosterone that causes the development of spermatogonia. The rate of spermatogenesis is controlled through a negative feedback mechanism induced by a [glycoprotein](#) hormone; inhibin released by [Sertoli cells](#). Inhibin decreases the rate of spermatogenesis by affecting the anterior pituitary which inhibits the release of FSH.

The process of production of female gametes is known as oogenesis. Oogenesis initially occurs in the Oogonium and the female eggs are produced before birth.

Oogonia are produced during the fetal stage. They undergo mitosis, and primary oocytes are produced through rapid cell division. It is covered by a layer of cells called granulosa cells. The whole structure is referred to as primordial follicles.



**Figure 02: Gametogenesis**

During birth, a female child possesses two millions of primordial follicles. During the whole period of childhood, the primary oocytes remain in the prophase stage of the first stage of meiosis (meiosis I). With the onset of puberty, the number of primordial follicles decreases to 60000 to 80000 in each ovary. Meiosis I completes in the formation of haploid ( $n$ ) secondary oocyte. The mature ovum completes meiosis II once the fertilisation process is completed. Similar to spermatogenesis, GnRH, LH and FSH involve in the regulation of oogenesis. [Progesterone](#) controls the rate.

## What are the Similarities Between Meiosis and Gametogenesis?

- Both meiosis and gametogenesis result in haploid cells.
- Both processes occur in sexual reproduction.
- In both processes, initial cell is diploid, and resulting cell is haploid.

# What is the Difference Between Meiosis and Gametogenesis?

## Meiosis vs Gametogenesis

Meiosis is a type of cell division that results in four haploid cells from a diploid parent cell.

Gametogenesis is the process of gamete formation.

## Summary - Meiosis vs Gametogenesis

Meiosis is one type of cell division that occurs during the sex cell formation. Meiosis produces haploid cells from diploid cells. The process of formation of gametes is referred to as gametogenesis. Gametogenesis includes spermatogenesis and oogenesis and results in the formation of haploid (n) sperms and eggs. Meiosis is required for the gametogenesis. This is the difference between meiosis and gametogenesis.

### Reference:

1. "Meiosis | Cell division | Biology (Article)." Khan Academy. [Available here](#)
2. "Gametogenesis." Wikipedia, Wikimedia Foundation, 11 Jan. 2018. [Available here](#)

### Image Courtesy:

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