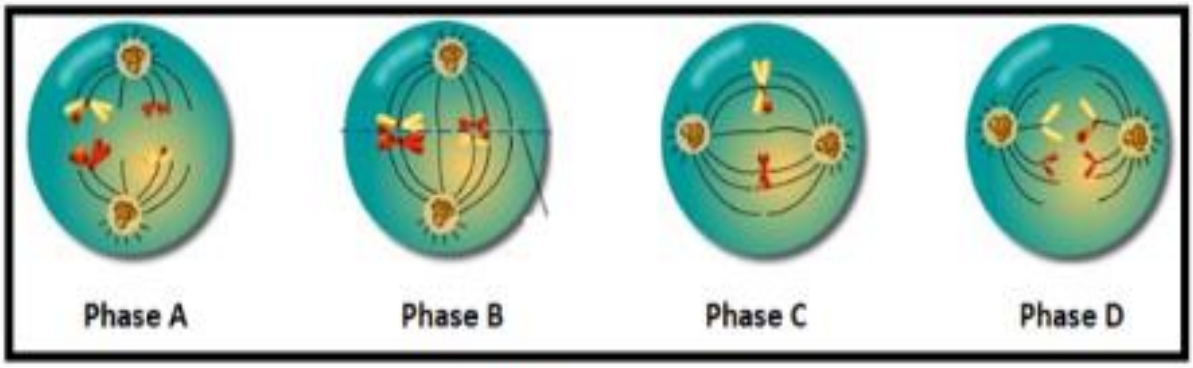
Meiosis is a cell division that aims to reduce the number of chromosomes of the diploid cell to the half, that is why meiosis is said to be a reductional division. Meiosis includes two cell divisions: meiosis I and meiosis II. During meiosis I the pairs of homologous chromosomes separate into the two daughter cells, the cells obtained at the end of meiosis I are haploid. During meiosis II there is a separation of sister chromatids and the number of chromosomes is conserved.

1. Pick out the importance of meiosis.
2. How can we differentiate a diploid cell from a haploid cell?

Document 1 shows cells during many phases of meiosis. Two of them are during meiosis one and the other two cells are during meiosis two.



Document 1

3. Name each of the phases of the cells shown in document 1. Justify.

Supposing that the DNA quantity of the mother cell undergoing this meiosis is of 12 a.u.:

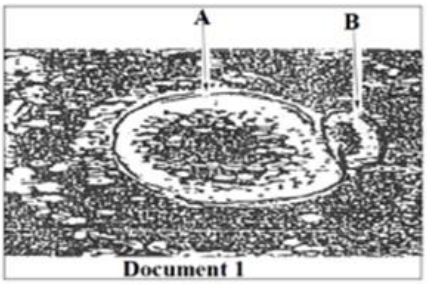
4. Indicate the DNA quantity in each of the cells of the phases B and C shown in document 1. Justify.
5. Indicate the DNA quantity of the cells obtained at the end of meiosis.

1. Meiosis is a cell division that aims to reduce the number of chromosomes of the diploid cell to the half.
2. Diploid cell has pairs of chromosomes called homologous chromosomes while the haploid cells have single chromosomes.
3. Phase A: Anaphase I, since there is separation of homologous chromosomes toward the opposite poles of the cell by polar ascension.
   Phase B: Metaphase I, since the tetrads (pairs of homologous chromosomes) are arranged to form the equatorial plate.
   Phase C: Metaphase II, since half the number of chromosomes (n) are arranged to form the equatorial plate.
   Phase D: Anaphase II, since there is separation of chromatids of (n) single chromosomes that separate toward the poles of the cell.
4. Cell of phase B contains 12 a.u. since it still contain 2n chromosomes of 2 chromatids each corresponding for the full DNA quantity of the mother cell.
   Cell of phase C contains 6 a.u. since it contains n chromosomes of 2 chromatids each corresponding for the half of the DNA quantity of the mother cell.
5. 3 a.u.

Oogenesis begins during fetal life starting from oogonia. An oogonium is able to multiply and achieve growth to transform into oocyte I arrested in prophase I. At puberty, during follicular development, oocyte I dissociates from surrounding cells and is released in the follicular cavity. Shortly before ovulation, the first meiotic division, which is arrested in prophase 1, is resumed and has given rise to two cells: oocyte II that remains arrested in metaphase II and the first polar body. Oocyte II either degenerates after 24 hours or continues its meiosis II to complete oogenesis.

Document 1 represents an electron micrograph of the two cells (A and B) just before ovulation.

1. Name by referring to the text, the two cells A and B of document 1. Justify
2. Indicate the number of chromosomes and the amount of DNA in each cell (A and B) in term of Q.
3. Indicate the condition that allows the oocyte II to continue its meiosis II



Document 1

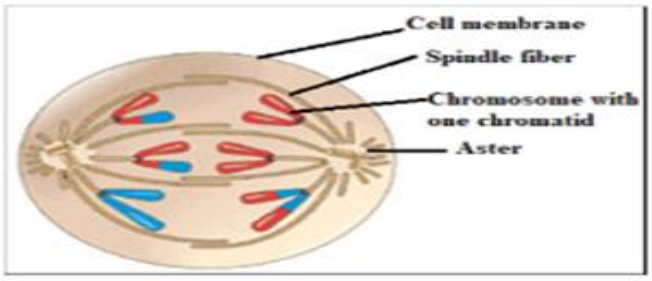
The table in document 2 shows the variation of the amount of DNA in a female germ cell observed after puberty and in the cells derived from it.

Time in hours	0	4	8	12	16	20	22	24
Quantity of DNA/ nucleus in a.u.	12.4	6.2	6.2	6.2	6.2	3.1	3.1	3.1

Document 2

4. Show, referring to text and document 2, that the germ cell mentioned above is an oocyte I.
5. Schematize for 2n = 6 the anaphase of meiosis made by the oocyte II.
6. Specify the number of chromosomes and the number of chromatids per chromosome in this cell at time 22h

1. A: oocyte II arrested in metaphase II because it retains most of the cytoplasm
   B: first polar body because it is reduced to the nucleus only
2. The number of chromosomes in both cells A and B cells is the same: 23 double chromosomes and they have the same amount of DNA (Q).
3. The fertilization (presence of a sperm cell)
4. The table shows a decrease in the amount of DNA twice in succession, the first is between 0 and 4 hours from 12.4 a.u. to 6.2 a.u. which corresponds to half, while the second is between 16 and 20 hours from 6.2 a.u. to 3.1 a.u. which corresponds to half. These two decreases indicate that meiosis had taken place, and since oocyte I is the oocyte, which performs meiosis I, then the germ cell mentioned is an oocyte I.
5. Anaphase II of meiosis n=3.



6. The number of chromosomes is n = 23 chromosomes of one chromatid each. Because after hour 16, the amount of DNA decreases to the half from 6.2 a.u to 3.1 a.u., this decrease corresponds to meiosis II where there is separation of the sister chromatids of the chromosomes in the two daughter cells, each containing n chromosomes with 1 chromatid corresponding to the half of the amount of DNA of the cell which has undergone meiosis II.