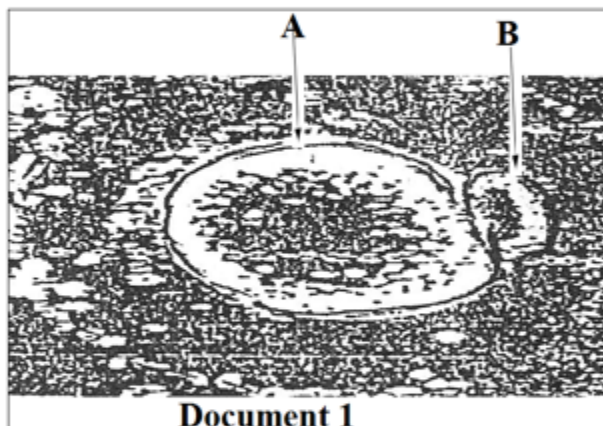


Question 1: The oogenesis of a female

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 I, 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.



Document 1

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

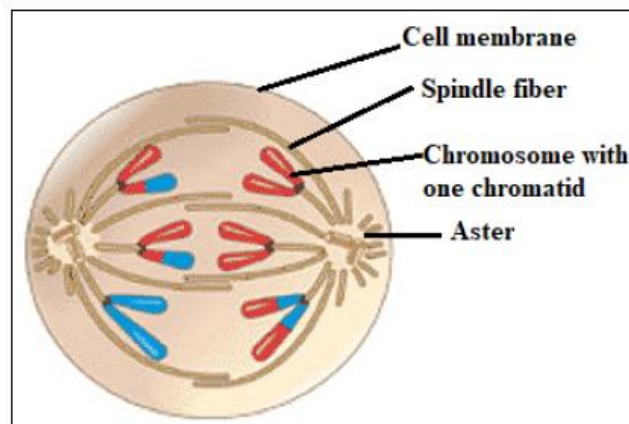
The table in document 2 shows the variation of the amount of DNA in a female germ cell observed after puberty and in the cells derived from it.

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. Justify that the oocyte I mentioned above has been ovulated (released) and fertilized.
7. 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 $2n=6$.



6. In order to achieve meiosis I, the oocyte I must be ovulated, and in order to achieve meiosis II, the obtained oocyte II must be fertilized, and as the table shows that meiosis I and meiosis II have been performed, then, the mentioned oocyte I was ovulated and fertilized.
7. 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.