MEIOSIS

DECODING THE BLUEPRINT OF LIFE

KYLIE AND YULIANA

INTRODUCTION

Have you ever thought about how you, as a person, got your traits and how you got each one from your parents? Well, I'm going to take you on a fascinating journey into the microscopic world of Meiosis! We'll be exploring how cells divide, how chromosomes dance, and how genetic info gets shuffled. Let's unravel these secrets together!!

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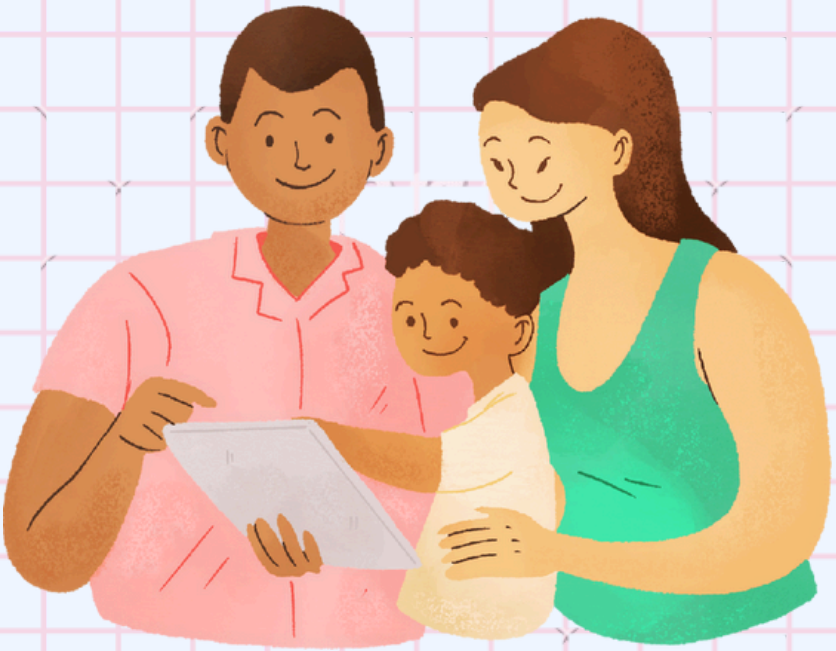
WHERE IT ALL BEGINS...

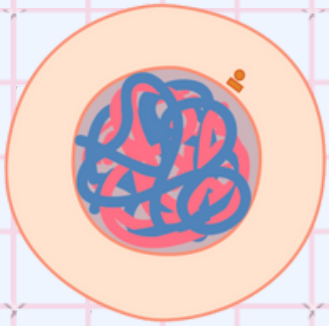
FIRST, IT ALL STARTS WITH YOUR PARENTS! GERM CELLS FROM THEIR OVARIES/TESTES GO THROUGH MEIOSIS, A PROCESS OF DIVISION. THIS CREATES EGG AND SPERM CELLS THAT HAVE 23 CHROMOSOMES EACH WHICH THEN ADD UP TO BECOME 46 CHROMOSOMES WHEN THEY FUSE. THESE 46 CHROMOSOMES BECOME A ZYGOTE. NOW LET'S TRANSITION OVER TO THE PHASES OF MEIOSIS.



MEIOSIS I
INTERPHASE + PROPHASE

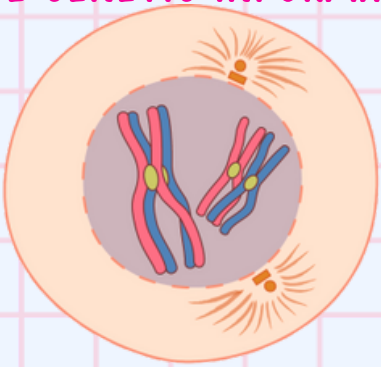
INTERPHASE

CHROMOSOMES REPLICATE, THEY ARE SPREAD OUT
BUT THEY AREN'T NOTICEABLE YET.



PROPHASE

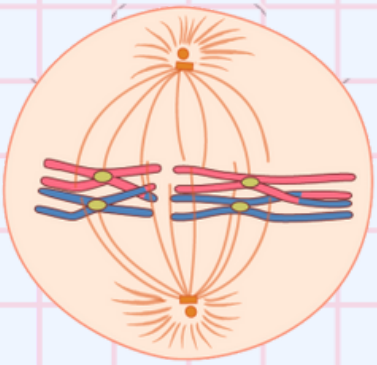
IN PROPHASE 1, HOMOLOGOUS PAIRS ARE MADE FROM DIPLOID CELLS, THEY'RE TOGETHER AND CAN BE MANIPULATED TOGETHER. DIPLOID CELLS ARE THE DIVIDING OF CELLS. CHROMOSOMES BECOME VISIBLE AND ARE DOUBLED, AND TWO SISTER CHROMATIDS ATTACHED BY A CENTROMERE ARE THE RESULT. CHROMOSOMES ARE STRANDS OF DNA THAT CARRY GENETIC INFORMATION. WHILE THE TWO SISTER CHROMATIDS ARE KNOWN AS TWO IDENTICAL COPIES OF A SINGLE CHROMOSOME. TETRADS FORM AND CROSSING OVER OCCURS, MAKING DISTINCTIVE CHROMOSOMES. THE TETRADS ARE TWO HOMOLOGOUS CHROMOSOMES WITH A TOTAL OF 4 SISTER CHROMATIDS. WHERE THEIR POINT IS KNOWN AS CHIASMA WHERE THE TWO CHROMATIDS CONNECT TO EXCHANGE GENETIC INFORMATION.



MEIOSIS I
METAPHASE + ANAPHASE

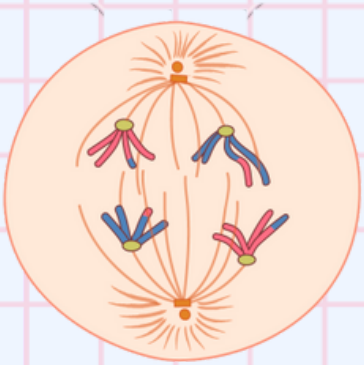
METAPHASE

IN METAPHASE I, THE CHROMOSOMES ALIGN INDEPENDENTLY OF EACH OTHER DUE TO THE PROCESS OF INDEPENDENT ASSORTMENT, LEADING TO UNIQUE COMBINATIONS OF GENETIC MATERIAL AS EACH CHROMOSOME FROM A HOMOLOGOUS PAIR POSITIONS ITSELF RANDOMLY IN THE MIDDLE OF THE CELL. EACH CHROMOSOME HAS ONE MEMBER OF EACH BUDDY PAIR, ALLOWING THEM TO HAVE DIFFERENT COMBINATIONS OF GENETIC MATERIAL. THAT PREPARES THE CHROMOSOMES FOR THE NEXT STAGE KNOWN AS ANAPHASE.



ANAPHASE

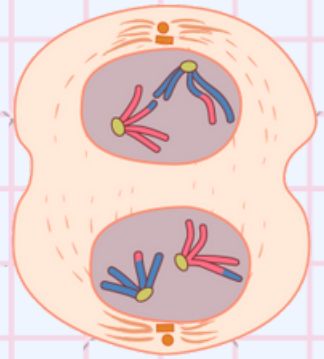
IN ANAPHASE 1, SISTER CHROMATIDS ARE STILL TOGETHER. CHROMOSOMES SEPARATE AND THEY MOVE TO OPPOSITE POLES. THE HOMOLOGOUS PAIRS, HAVING 2 CHROMOSOMES EACH, ARE PULLED APART. THIS RESULTS IN A REDUCED AMOUNT OF CHROMOSOMES. IN THE END, TWO DAUGHTER CELLS ARE MADE CONSISTING OF UNIQUE COMBINATIONS OF CHROMOSOMES.



MEIOSIS I
TELOPHASE + CYTOKINESIS

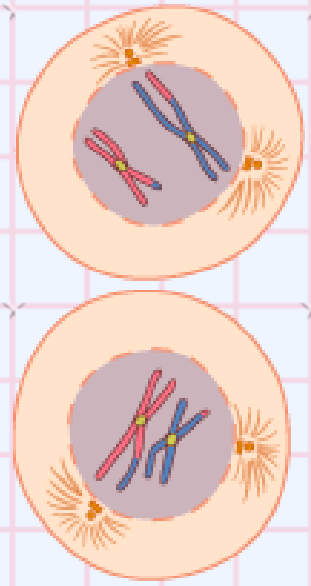
TELOPHASE

THE SEPARATED CHROMOSOMES GATHER AT THE ENDS OF THE OPPOSITE ENDS OF THE CELL. THEN THE NUCLEAR ENVELOPE FORMS IN EACH OF THE CHROMOSOME GROUPS. WHICH THEN LEAVES US WITH TWO NEW CELLS THAT NEED TO SPLIT.



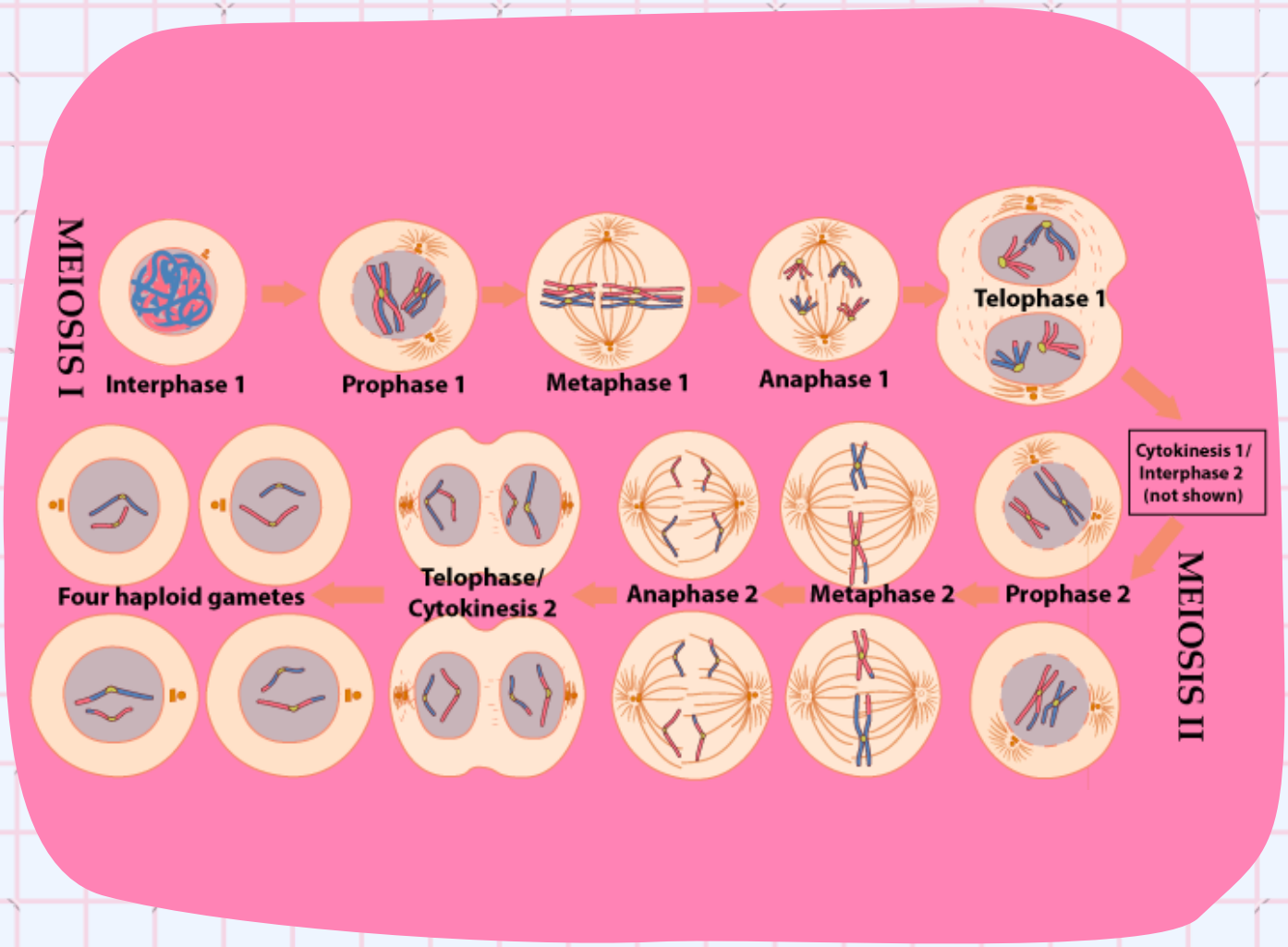
CYTOKINESIS

THE OUTER PART OF THE CELL KNOWN AS THE CELL MEMBRANE STARTS PINCHING THE MIDDLE OF IT. WHICH SPLITS THE TWO CELLS APART WHICH NOW ARE HAPLOIDS. HAPLOIDS ARE CELLS WITH HALF ONE SET OF CHROMOSOMES.



THE TRANSITION OF MEIOSIS I TO MEIOSIS II

FROM MEIOSIS I WE WERE LEFT WITH 2 DAUGHTER CELLS ALSO KNOWN AS A HAPLOID, FROM THE WHOLE PROCESS. WHICH MADE THE NUMBER OF CHROMOSOMES HAVE A REDUCTION AND BECOME 1 SET.

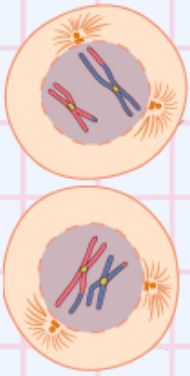


MEIOSIS II

INTERPHASE II + PROPHASE II

INTERPHASE II

THE CELL STARTS PREPARING FOR THE NEXT SPLIT AND MAKES SURE THAT EVERYTHING IS IN ORDER. WHICH IS WHEN THE S PHASE COMES IN MAKING SURE THAT EACH CHROMATID HAS A PARTNER AND THAT THERE ARE STILL CHROMATIDS. G2 IS WHEN THE CELL GROWS MORE AND MAKES SURE EVERYTHING IS READY FOR THE FINAL SPLIT. WHEN IT SPLITS IT HAS 4 NEW CELLS THAT HAVE DISTINCT SETS OF CHROMOSOMES.



PROPHASE II

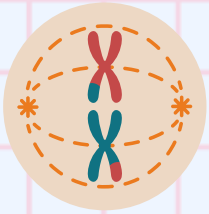
AFTER MEIOSIS 1 WE END UP WITH TWO DAUGHTER CELLS. THE CHROMOSOMES INSIDE EACH DAUGHTER CELL CONDENSE TOGETHER AND THE NUCLEAR ENVELOPE DISAPPEARS. THE CELL IS NOW GETTING READY FOR THE NEXT SPLIT AND THE MICROTUBULES START FORMING TO SPLIT THE CHROMOSOMES AGAIN. THIS IS HOW PROHASE 2 DIFFERS FROM PROHASE 1 BECAUSE THERE IS NO SYNAPSIS OR CROSSING OVER.

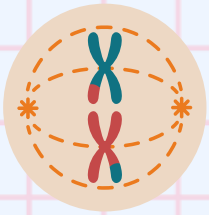
MEIOSIS II

METAPHASE II + ANAPHASE II

METAPHASE II

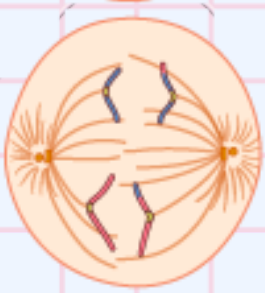
ANOTHER SPINDLE FORMS AND DOUBLED CHROMOSOMES ARE LINED UP AT THE CENTER, THE CELL EQUATOR. CHROMOSOMES ALIGN INDEPENDENTLY OF THEIR PREVIOUS ORIENTATION, MAKING IT RANDOM.





ANAPHASE II

THE SISTER CHROMATIDS FINALLY GET SPLIT UP AND ARE PULLED APART AS THE MICROTUBULES SHORTEN. EACH CHROMATID BECOMES AN INDEPENDENT CHROMOSOME AND GOES TO THE OPPOSITE ENDS OF THE CELL.

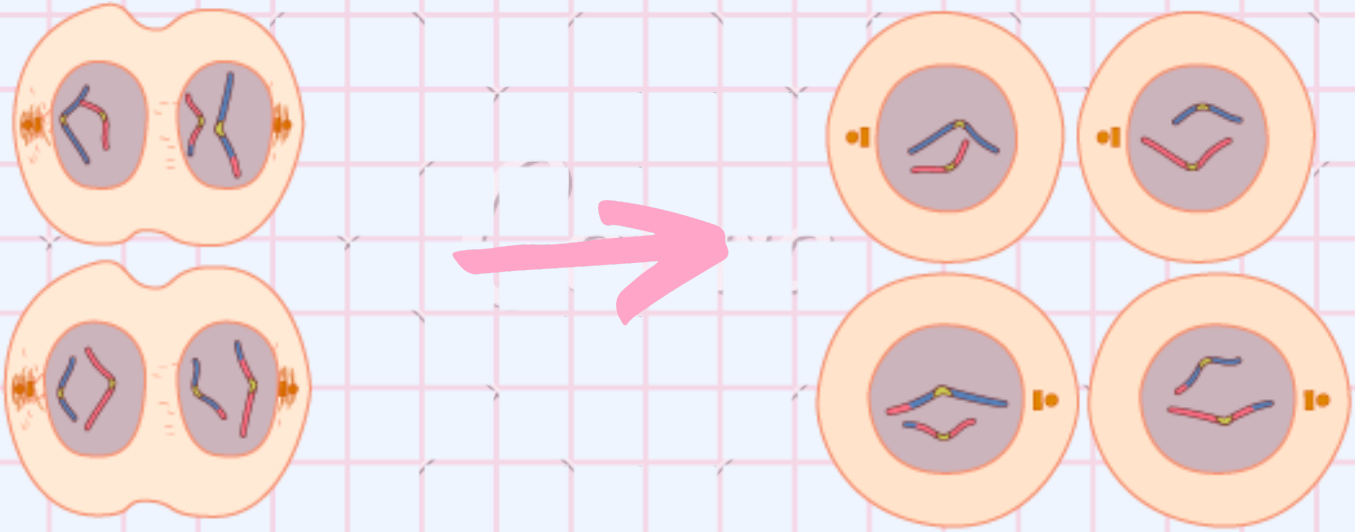


MEIOSIS II

TELOPHASE II + CYTOKINESIS

TELOPHASE II & CYTOKINESIS

A NUCLEUS FORMS AROUND CHROMOSOMES. THE CELLS DIVIDE INTO SEPARATE CELLS CREATING FOUR HAPLOID GAMETES. EACH OF THE MALE'S FOUR CELLS WILL BECOME A SPERM CELL WHILE IN FEMALES, MOST OF THE CYTOPLASM GETS PUSHED TO ONE OF THE FOUR CELLS. THIS CELL WILL BECOME THE EGG. THE REST ARE SACRIFICED OR CONTRIBUTE DURING FERTILIZATION/EARLY DEVELOPMENT.

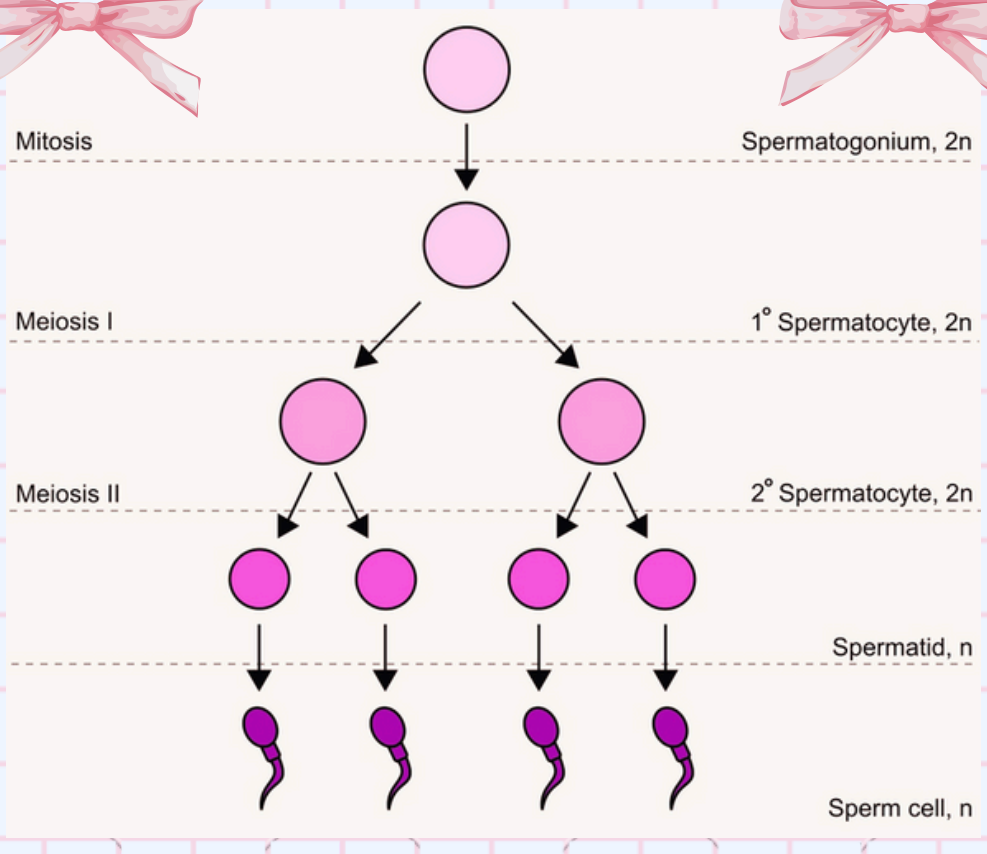


TELOPHASE II

CYTOKINESIS

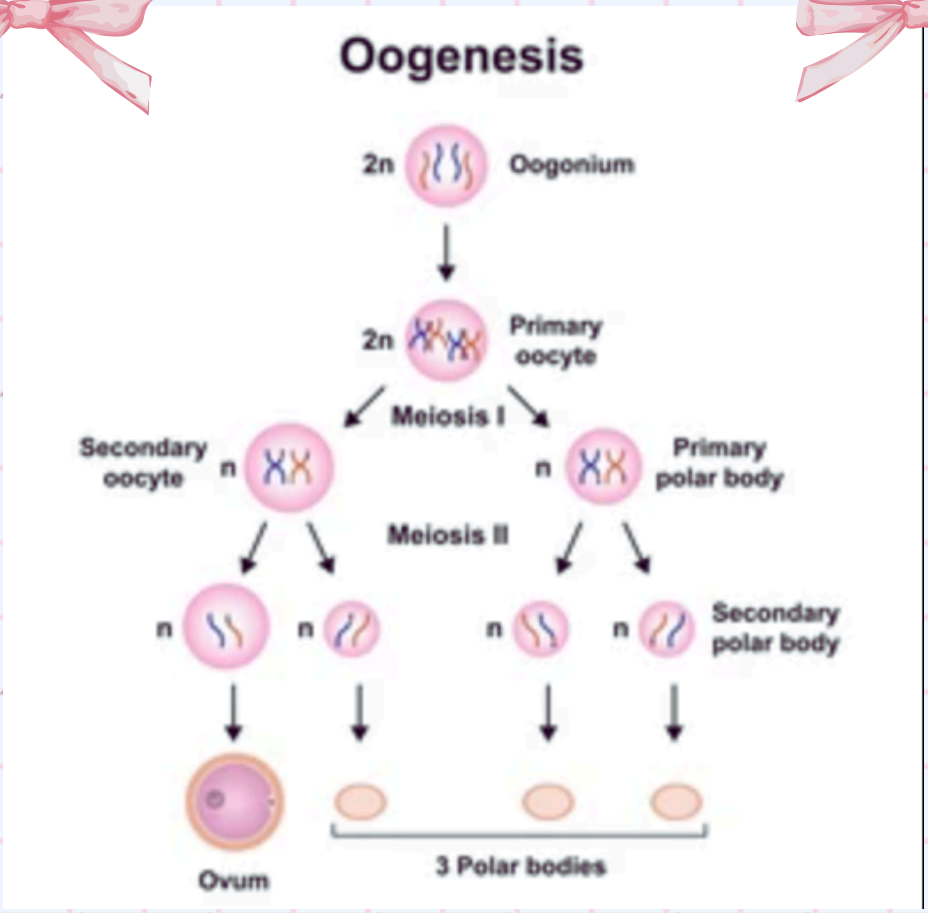
SPERMATOGENESIS
A MEIOTIC PROCESS

SPERMATOGENESIS IS THE PRODUCTION OF SPERM! PUBERTY IS THE BEGINNING OF THIS PROCESS AND CONTINUES INTO OLD AGE. A DIPLOID CELL, SPERMATOGONIUM, GOES THROUGH MITOSIS, AND THIS RESULTS IN 2 PRIMARY SPERMATOCYTES (GERM CELLS).
THESE SPERMATOCYTES WILL BE SPLIT INTO TWO SECONDARY SPERMATOCYTES IN MEIOSIS 1.
THEN THEY DIVIDE AGAIN AND BECOME 4 SPERMATIDS. THE 4 SPERMATIDS BECOME MOTILE AND MAKE 4 SPERM CELLS OF THE SAME SIZE. BECAUSE WE BEGIN WITH 2 SPERMATOCYTES, 8 SPERM CELLS ARE MADE FROM A SINGLE SPERMATOGONIUM.



OOGENESIS & POLAR BODIES
A MEIOTIC PROCESS

OOGENESIS IS THE PRODUCTION OF EGG CELLS! THIS PROCESS BEGINS BEFORE BIRTH, INSIDE AN EMBRYO. SIMILARLY, THE OOGONIUM GOES THROUGH MITOSIS AND DIVIDES INTO TWO PRIMARY OOCYTES. OOGENESIS IS PAUSED AFTER A GIRL IS BORN BUT CONTINUES AFTER PUBERTY. AFTER PUBERTY THE PRODUCTION OF EGG CELLS REACTIVATES, THIS IS ALSO WHEN MEIOSIS 1 HAPPENS. THE PRIMARY OOCYTES DIVIDE INTO SECONDARY OOCYTES BECAUSE OF RELEASED HORMONES IN THE BODY. THEN THIS PROCESS IS PAUSED AGAIN UNTIL FERTILIZATION, THAT'S WHEN MEIOSIS 2 OCCURS. THE CYTOPLASM DOES NOT DIVIDE EQUALLY IN EITHER STAGE OF MEIOSIS, THIS IS SO AN EGG CAN FORM ALONG WITH 2 POLAR BODIES. THE POLAR BODIES DISSOLVE WHILE THE EGG DEVELOPS! A SINGLE OOGONIUM GENERATES 2 EGG CELLS.



THE IMPORTANCE OF MEIOSIS

MEIOSIS GUARANTEES THE PROPER CHROMOSOME COUNT IN ORGANISMS GENERATED THROUGH SEXUAL REPRODUCTION AND INTRODUCES GENETIC DIVERSITY THROUGH THE MECHANISM OF RECOMBINATION. THE OVERALL PURPOSE OF THIS PROCESS IS TO MAKE GAMETES WITH HALF THE AMOUNT OF GENETIC INFORMATION FROM PARENTS. THE RESULTS ARE 4 HAPLOIDS CONTAINING HALF THE AMOUNT OF CHROMOSOMES FROM PARENTS. THESE CONTRIBUTE TO THE CREATION OF A DIPLOID ZYGOTE AND IN THE MAKING OF EVERYBODY!