GAMETOGENESIS AND FERTILIZATION

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GAMETOGENESIS

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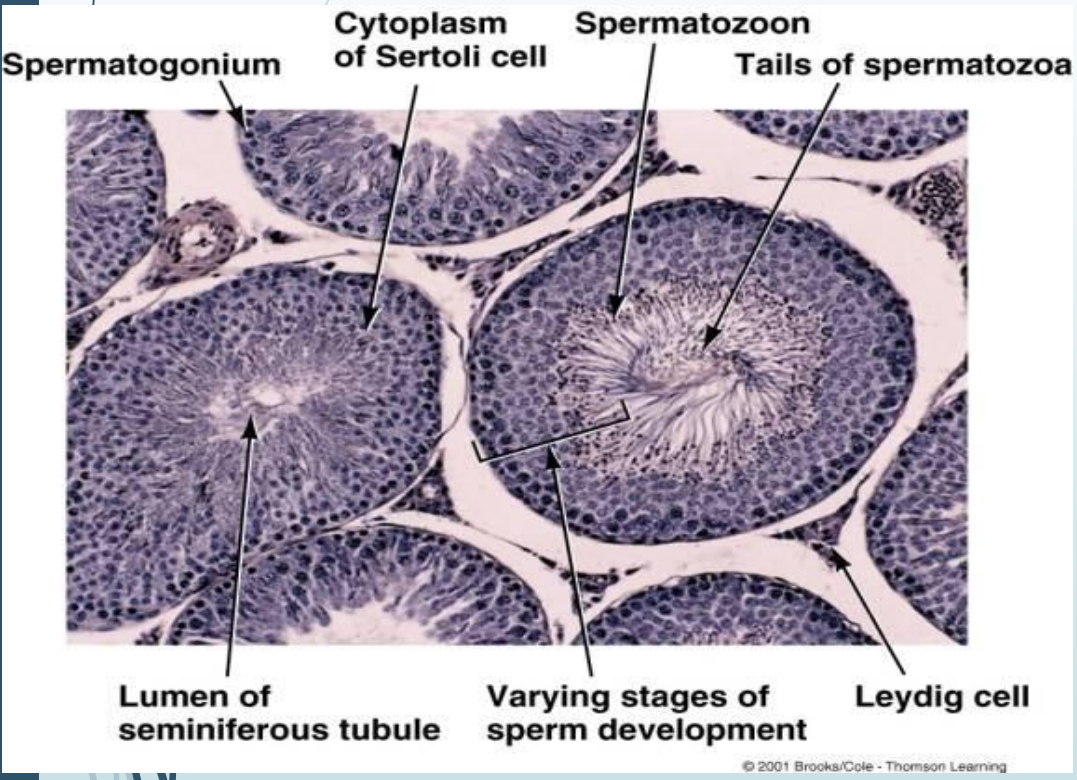
- Process of formation and development of male and female gametes
- Occurs in the gonads (testis and ovary)
- Termed spermatogenesis (in males) and oogenesis (in females)

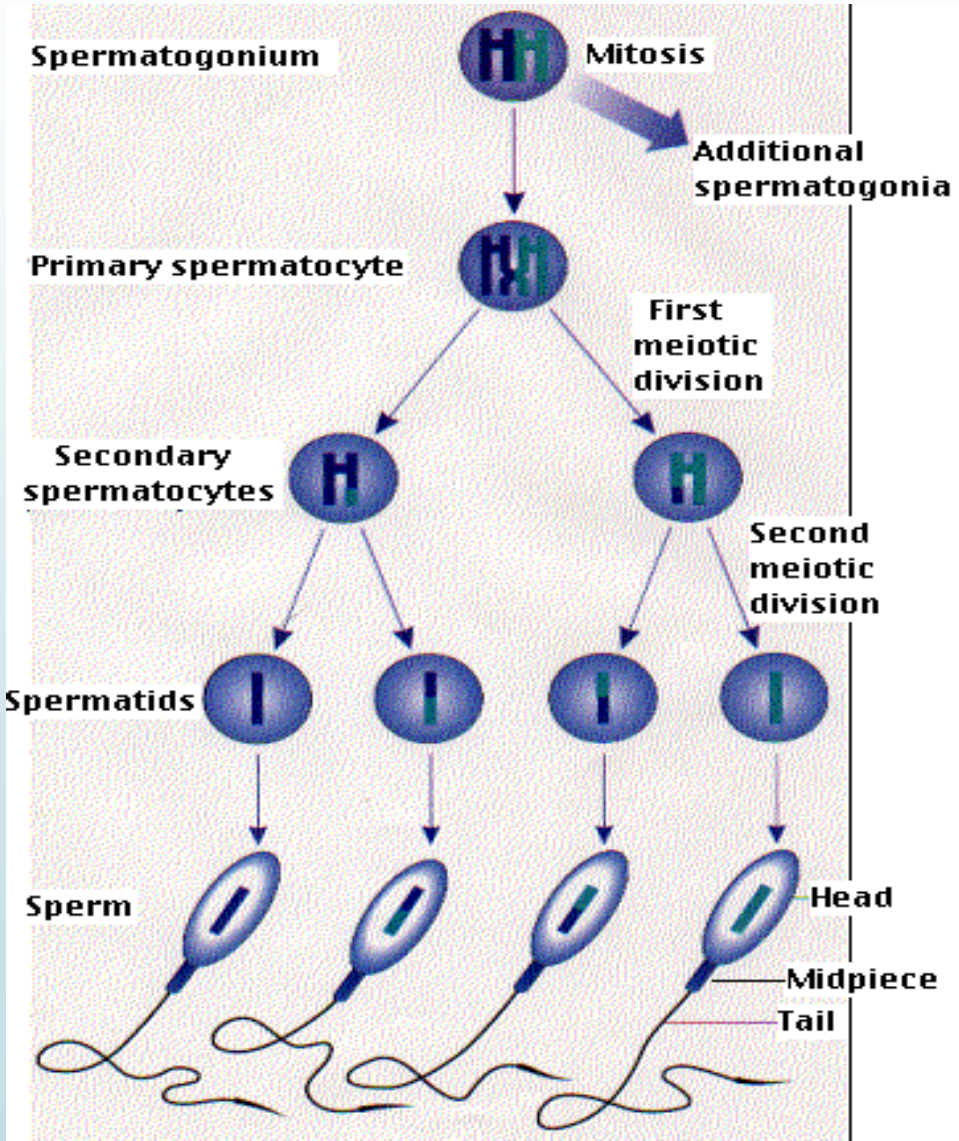
SPERMATOGENESIS



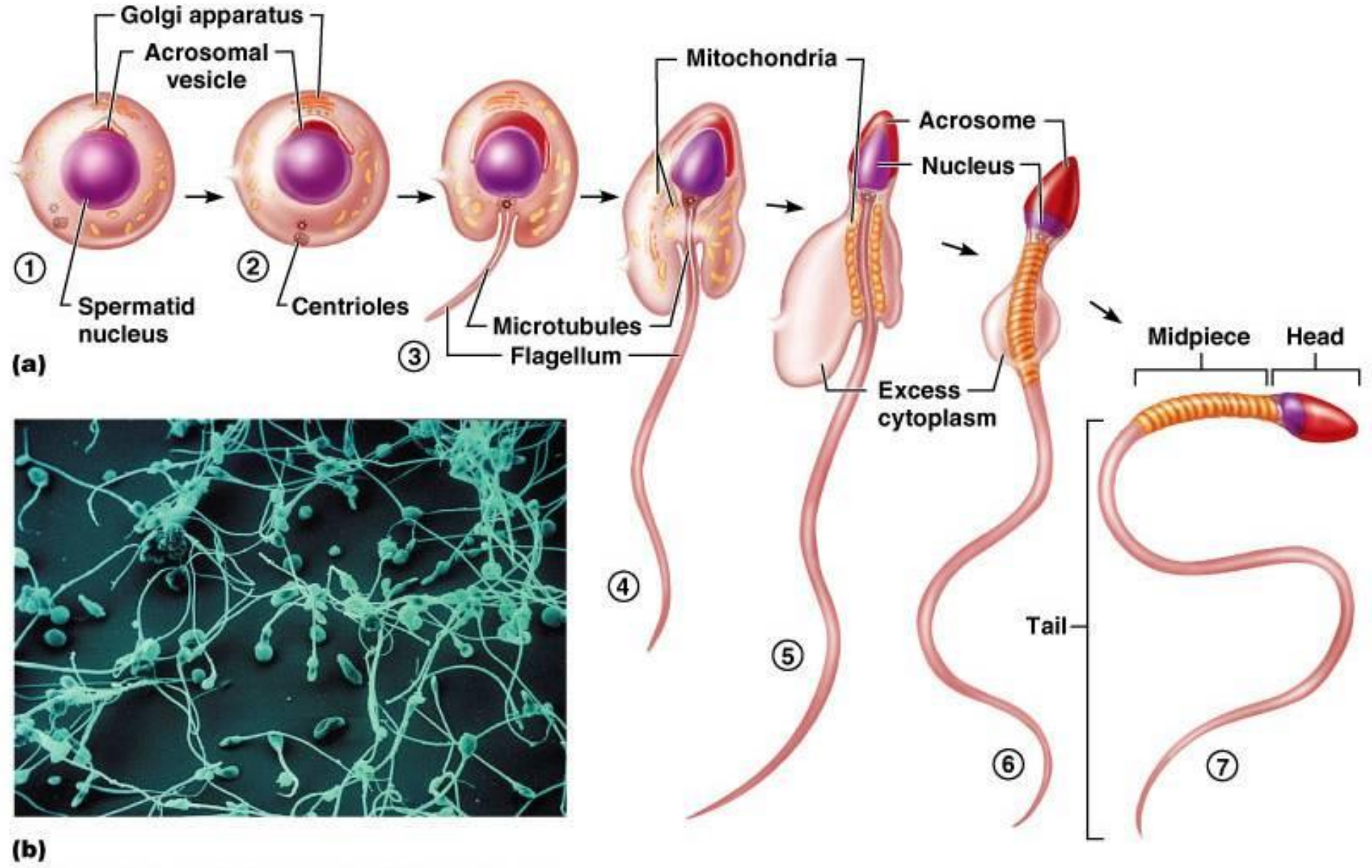
- Process of formation of sperms (male gametes)
- Site?
- Begins at puberty
- Takes approximately 64 days
- Occur in phases

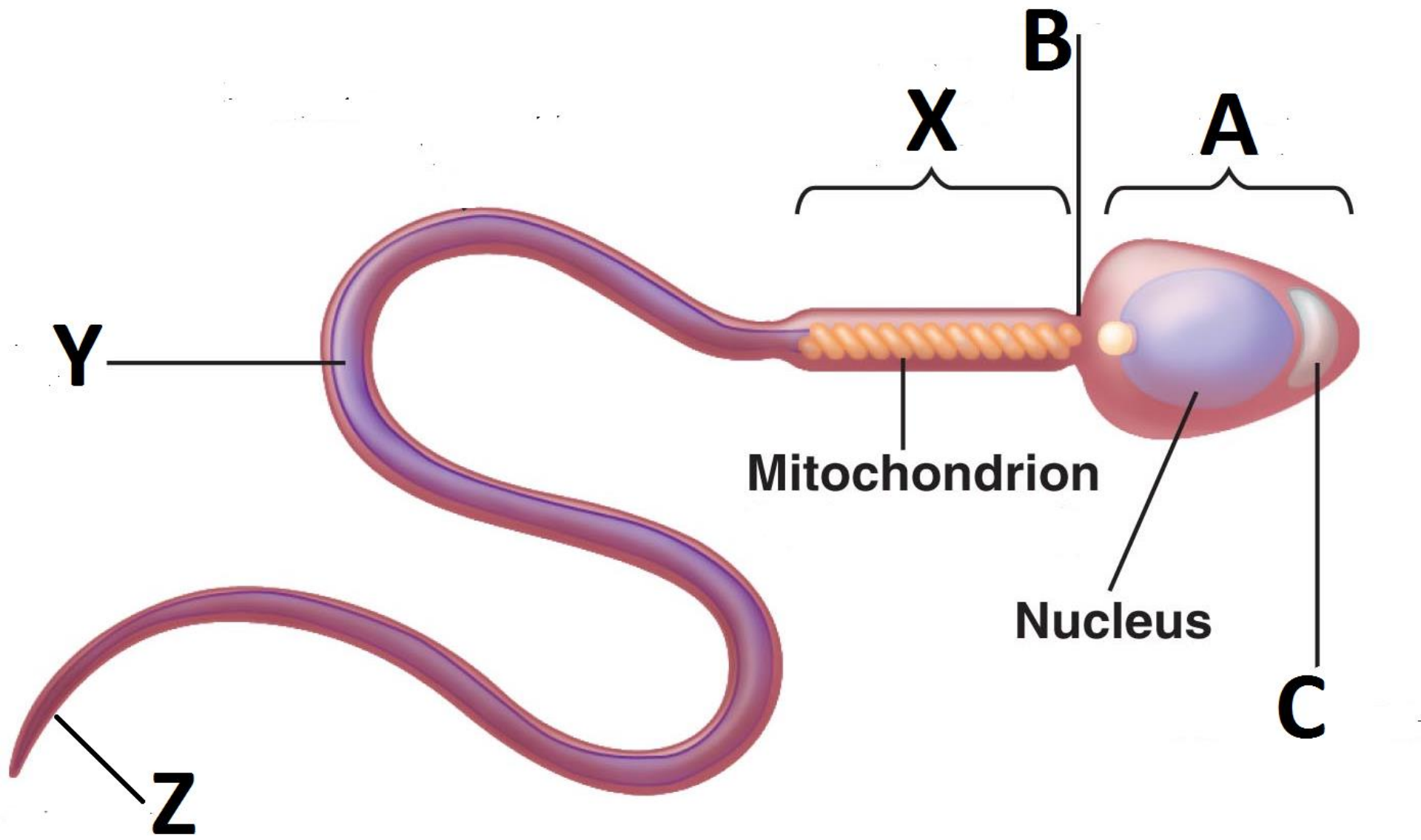
PHASES OF SPERMATOGENESIS

1. Spermatocytogenesis
2. Meiosis
3. Spermiogenesis
4. Spermiation
5. Capacitation



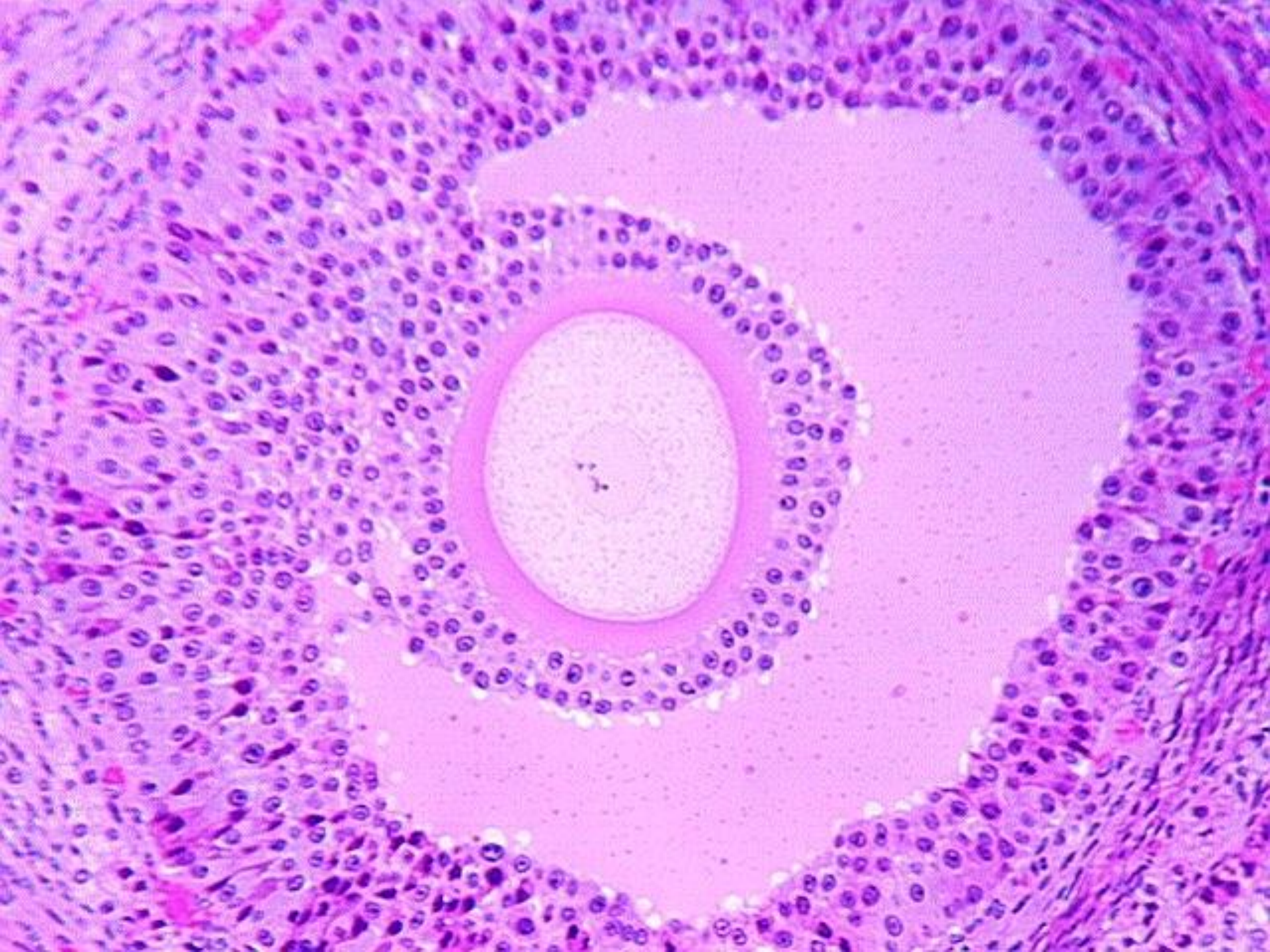
SPERMIOGENESIS




B
X
A
Y
Mitochondrion
Nucleus
C
Z

OOGENESIS

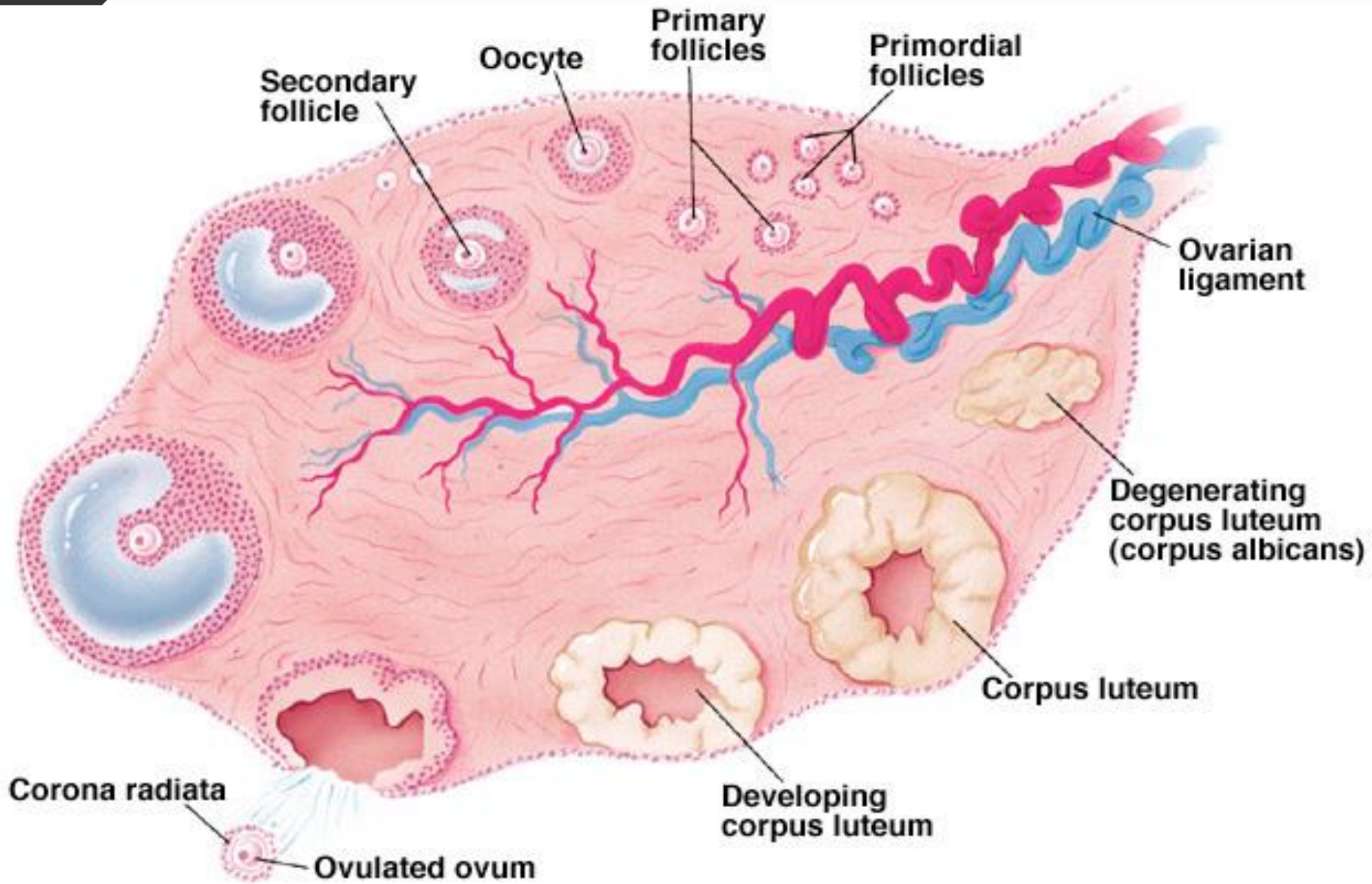
- Begins before birth with mitosis to form primary oocyte
- 1st meiotic division arrested at Prophase I before birth
- Cell division (Meiosis I) completed after puberty, on a monthly basis (according to the female reproductive cycle)
- Ovum is surrounded by follicular cells and zona pellucida

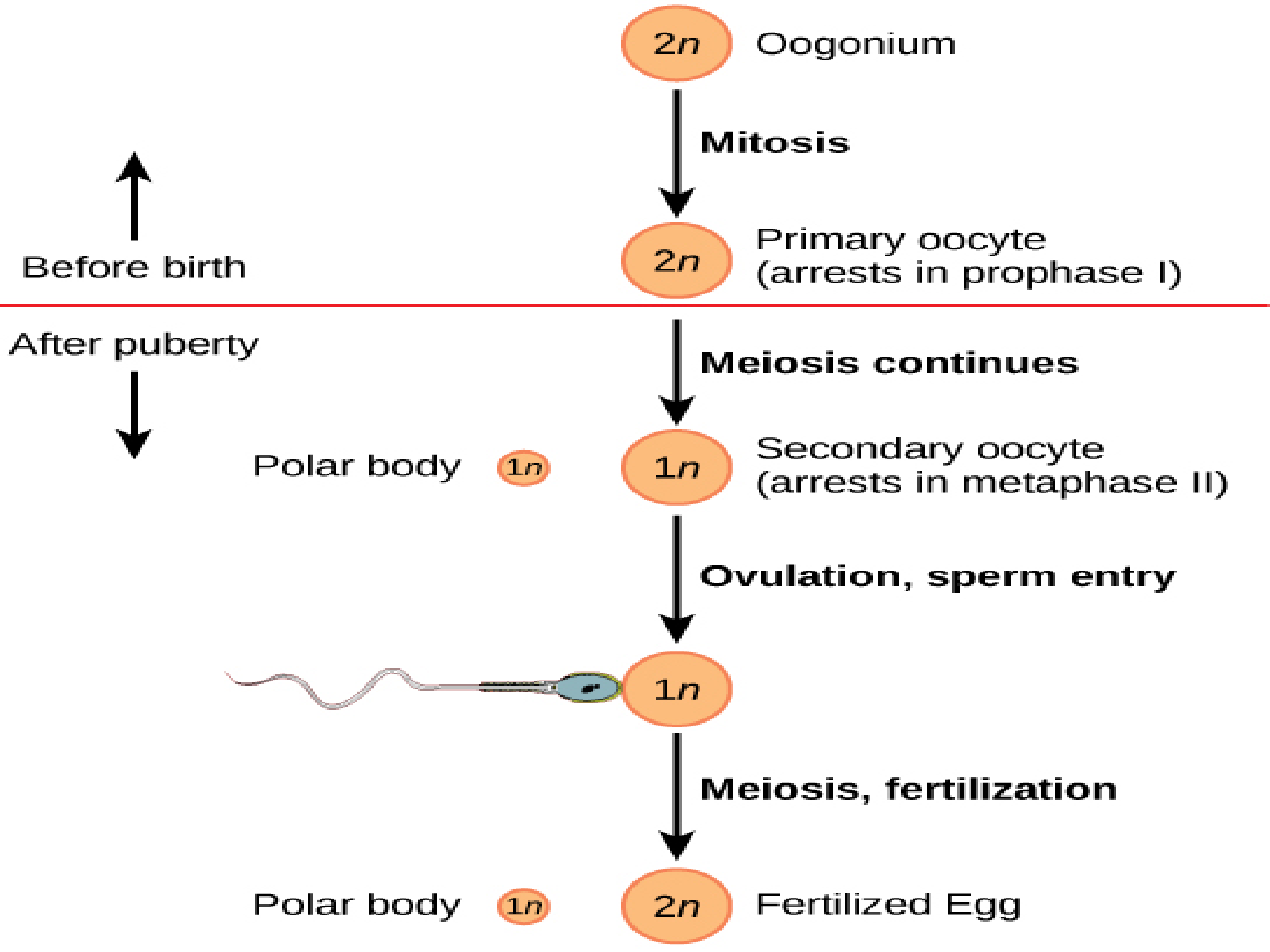


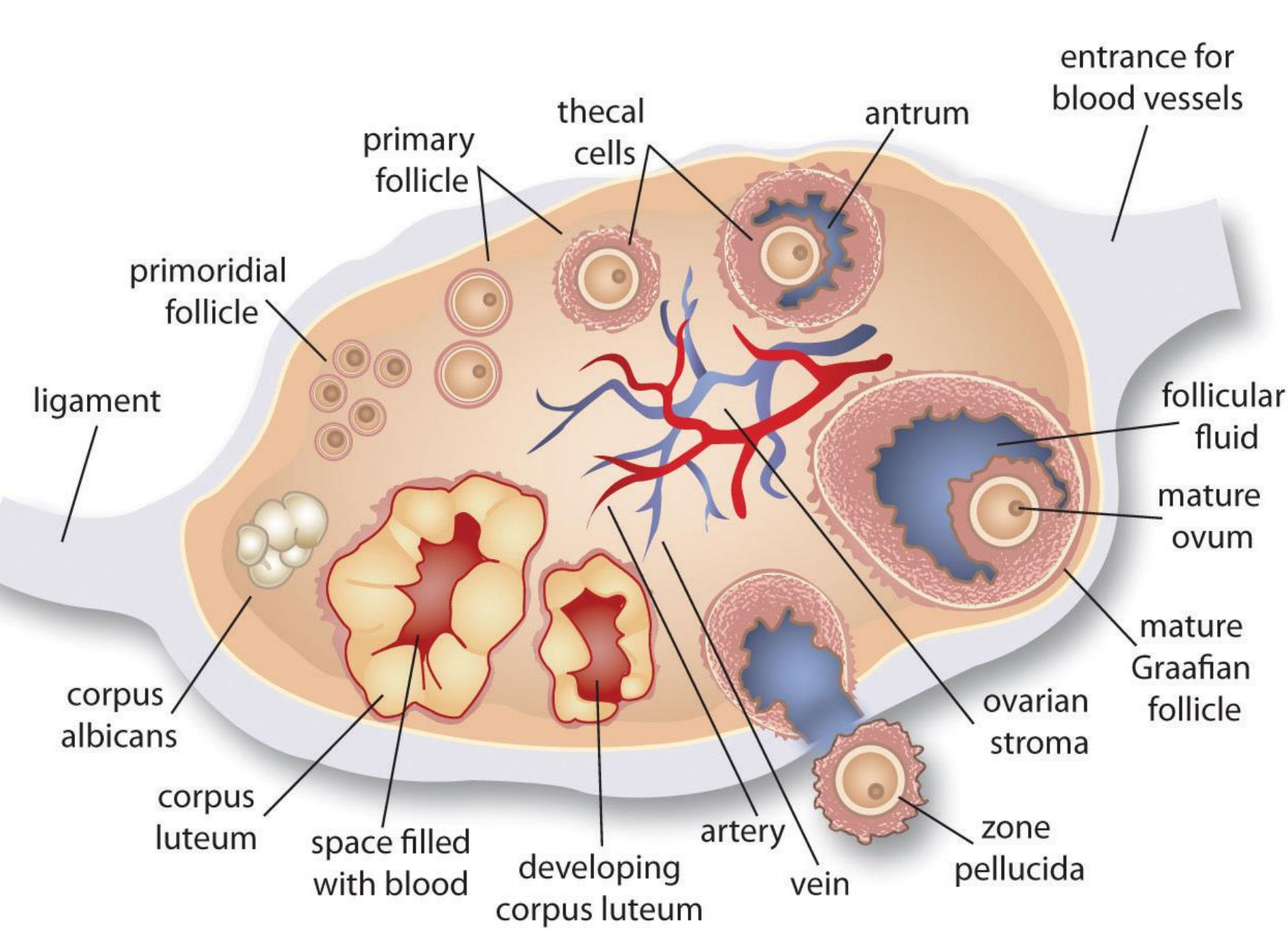
OOGENESIS

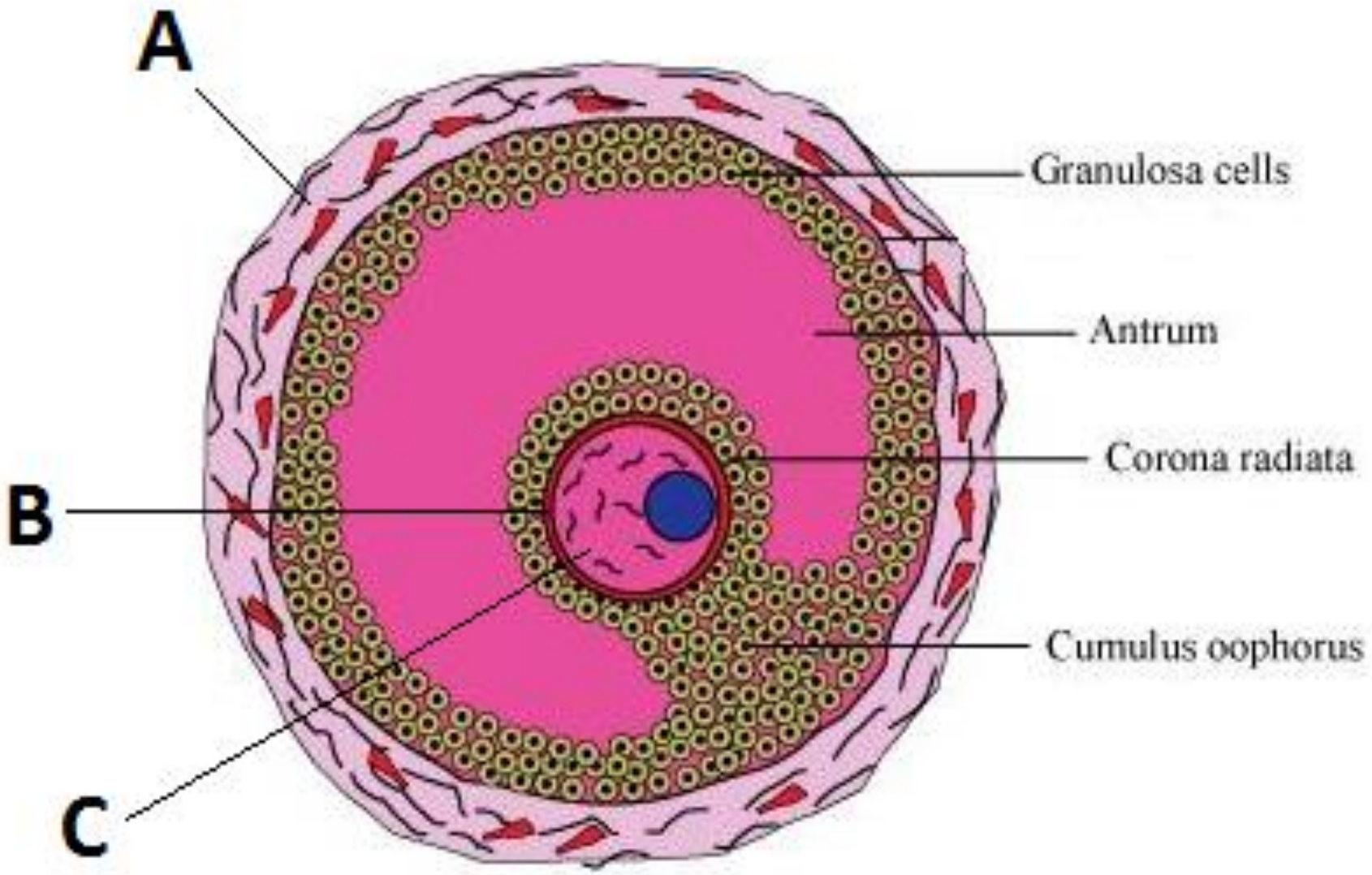
- 2nd meiotic division arrested at Metaphase II just before ovulation
- Cell division (Meiosis II) only completed if fertilization occurs

OOGENESIS


Primary follicles
Oocyte
Primordial follicles
Secondary follicle
Ovarian ligament
Degenerating corpus luteum (corpus albicans)
Corpus luteum
Developing corpus luteum
Corona radiata
Ovulated ovum


2n
Oogonium
Mitosis
2n
Primary oocyte
(arrests in prophase I)
Before birth
After puberty
Meiosis continues
Polar body
1n
1n
Secondary oocyte
(arrests in metaphase II)
Ovulation, sperm entry
1n
Meiosis, fertilization
Polar body
1n
2n
Fertilized Egg


entrance for blood vessels
thecal cells
antrum
primary follicle
primordial follicle
ligament
follicular fluid
mature ovum
mature Graafian follicle
corpus albicans
corpus luteum
space filled with blood
developing corpus luteum
artery
vein
ovarian stroma
zone pellucida



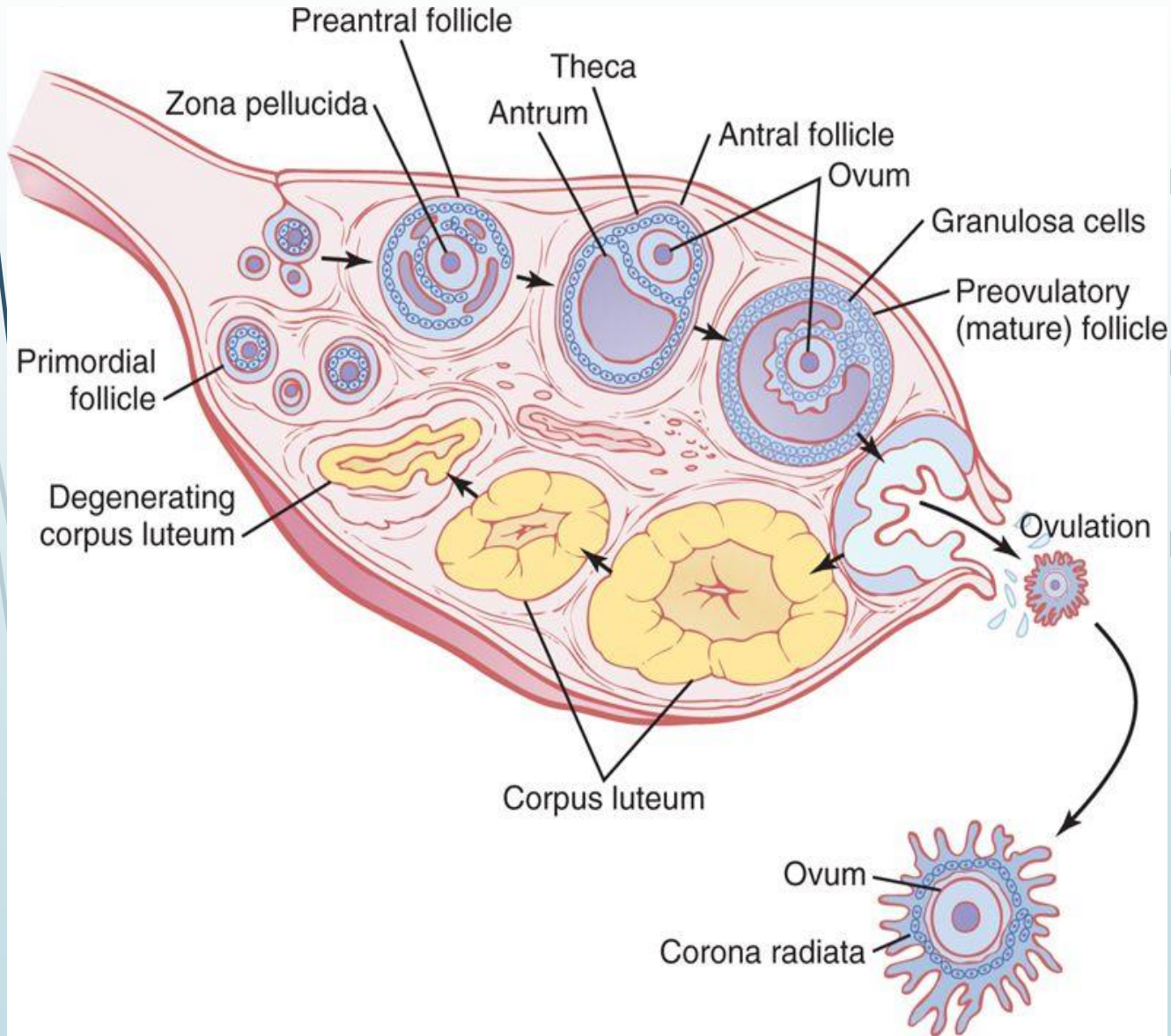
Structure of the Graafian follicle

Outline the differences between spermatogenesis and oogenesis

FEMALE REPRODUCTIVE CYCLES

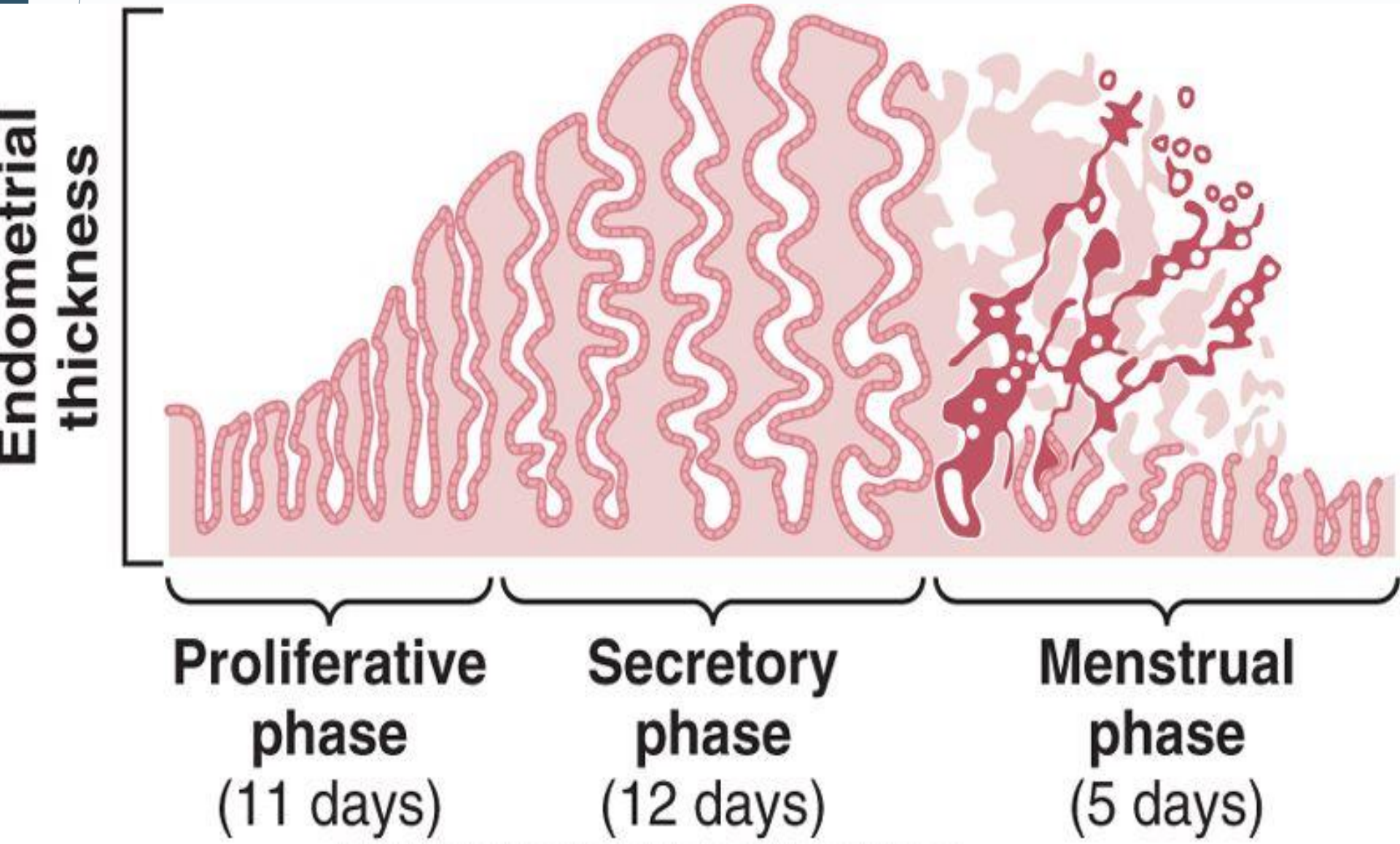
- Hormonally regulated “monthly” cycles
- Changes in the ovary – ovarian cycles
- Changes in the endometrial lining - endometrial cycles
- Regulated by gonadotropins from the pituitary gland
- Follicle stimulation hormone (FSH) and Luteinizing hormone (LH)

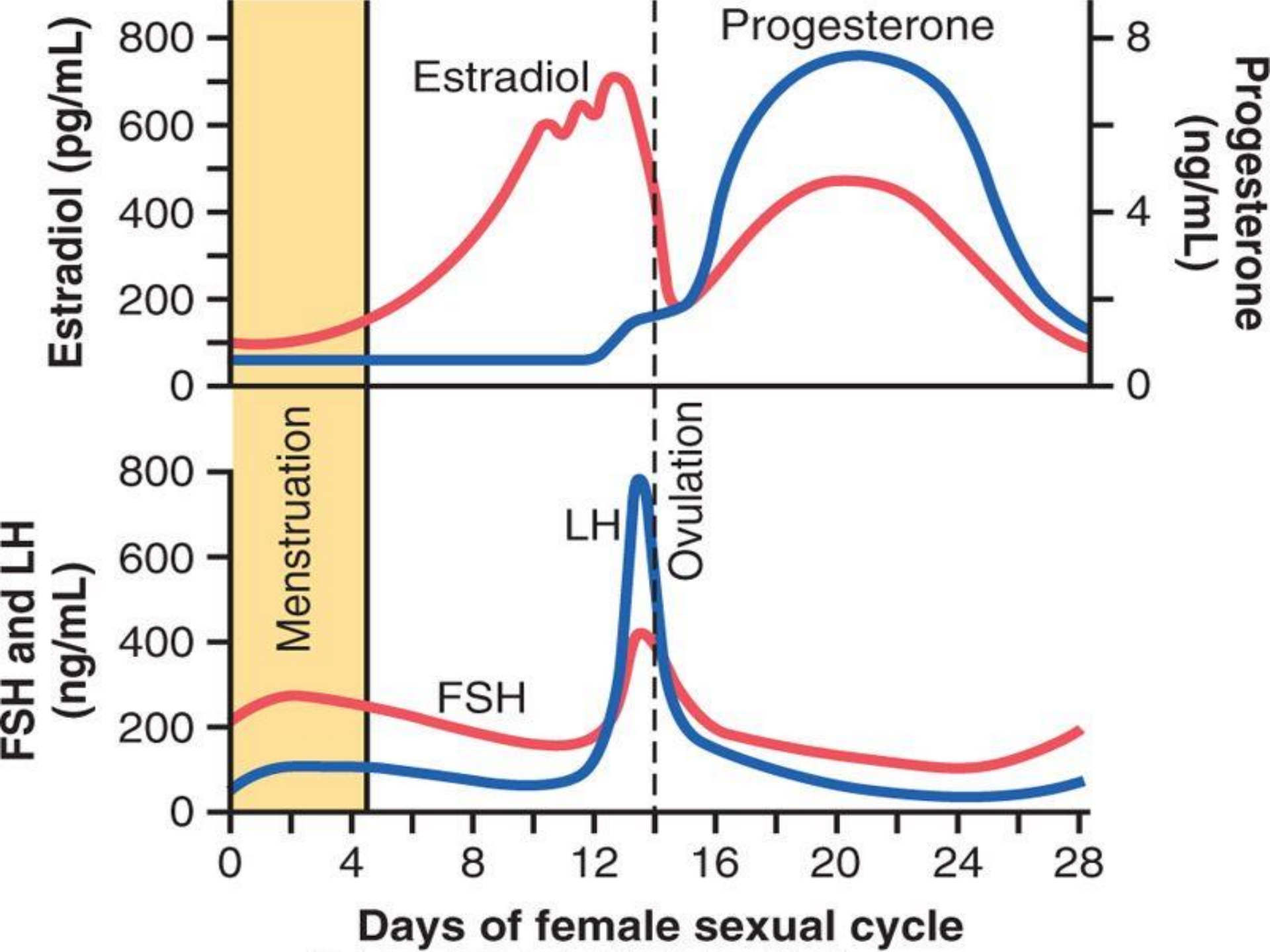
OVARIAN CYCLES



- Follicular
- Ovulatory
- Luteal

ENDOMETRIAL CYCLES

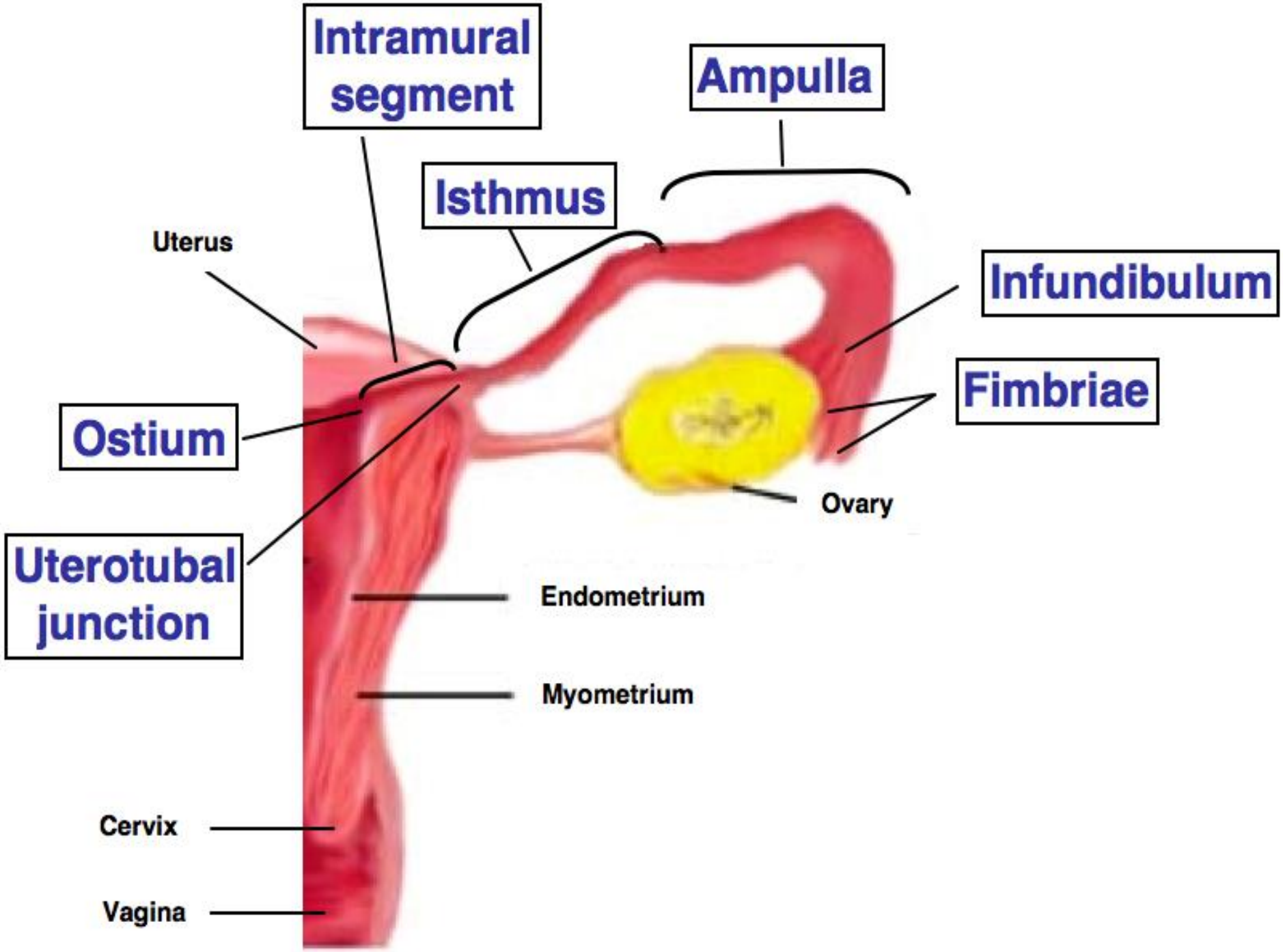


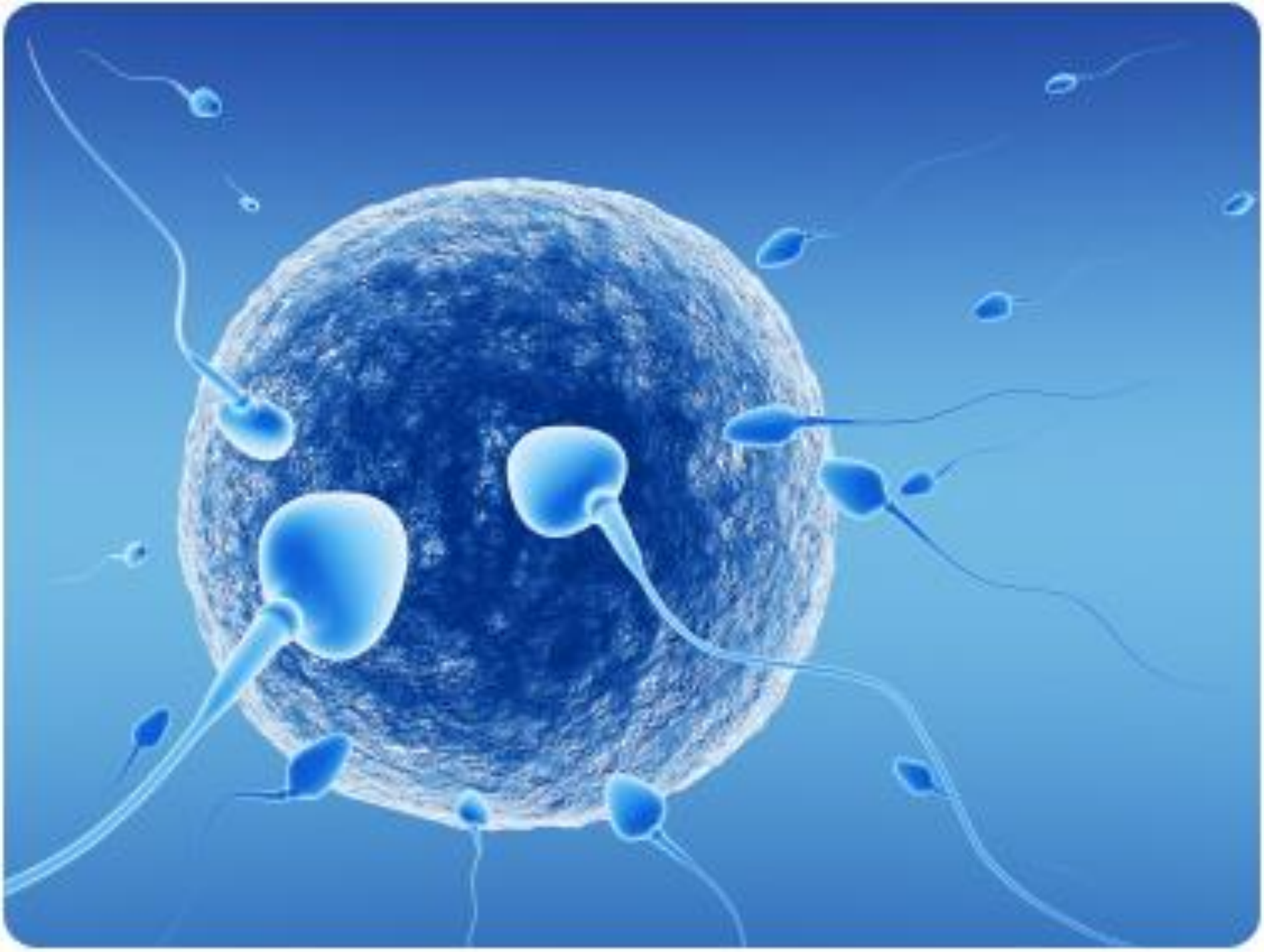

Estradiol (pg/mL)
800
600
400
200
0
Estradiol
Progesterone
8
4
0
Progesterone (ng/mL)
Menstruation
Ovulation
FSH and LH (ng/mL)
800
600
400
200
0
LH
FSH
0
4
8
12
16
20
24
28
Days of female sexual cycle

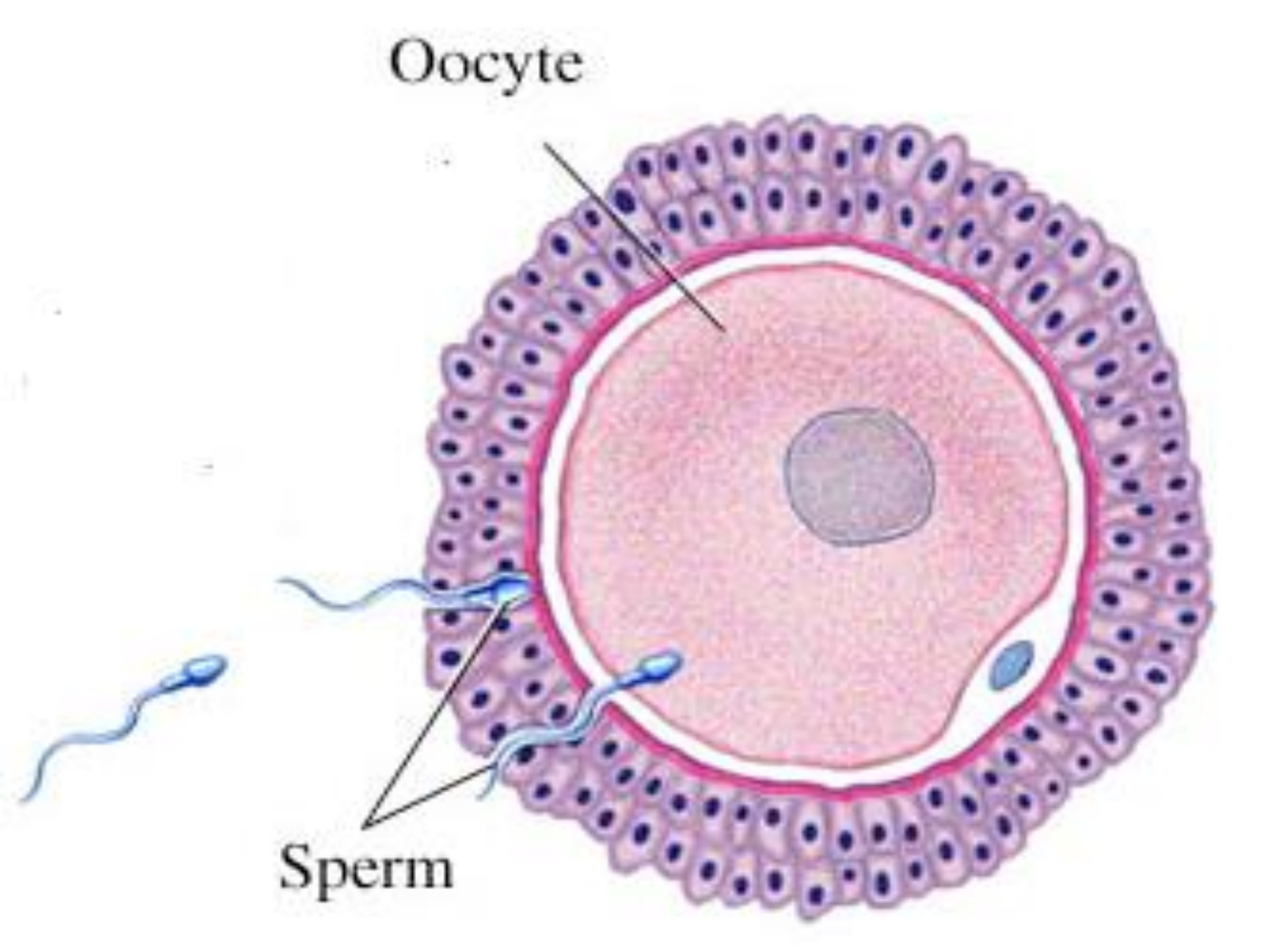
FERTILIZATION

FERTILIZATION

- Process of fusion of the male gametes (sperms) and female gametes (ovum) to form the zygote
- Occurs is the ampulla of the uterine tube


Intramural segment
Ampulla
Isthmus
Uterus
Infundibulum
Fimbriae
Ostium
Ovary
Uterotubal junction
Endometrium
Myometrium
Cervix
Vagina




Oocyte
Sperm

FERTILIZATION PROCESS

1. Capacitation
2. Acrosome reaction
3. Penetration of oocyte coats: corona radiata then zona pellucida
4. Zona reaction
5. Fusion of plasma membranes
6. Completion of 2nd meiotic division
7. Fusion of the pronuclei

RESULTS OF FERTILIZATION

1. Completion of the oocyte 2nd meiotic division
2. Formation of the zygote
3. Restoration diploid number (2n)
4. Genotypic sex determination
5. Species variation
6. Initiation of cleavage

Highlight various clinical applications related to the science of fertilization

THE END