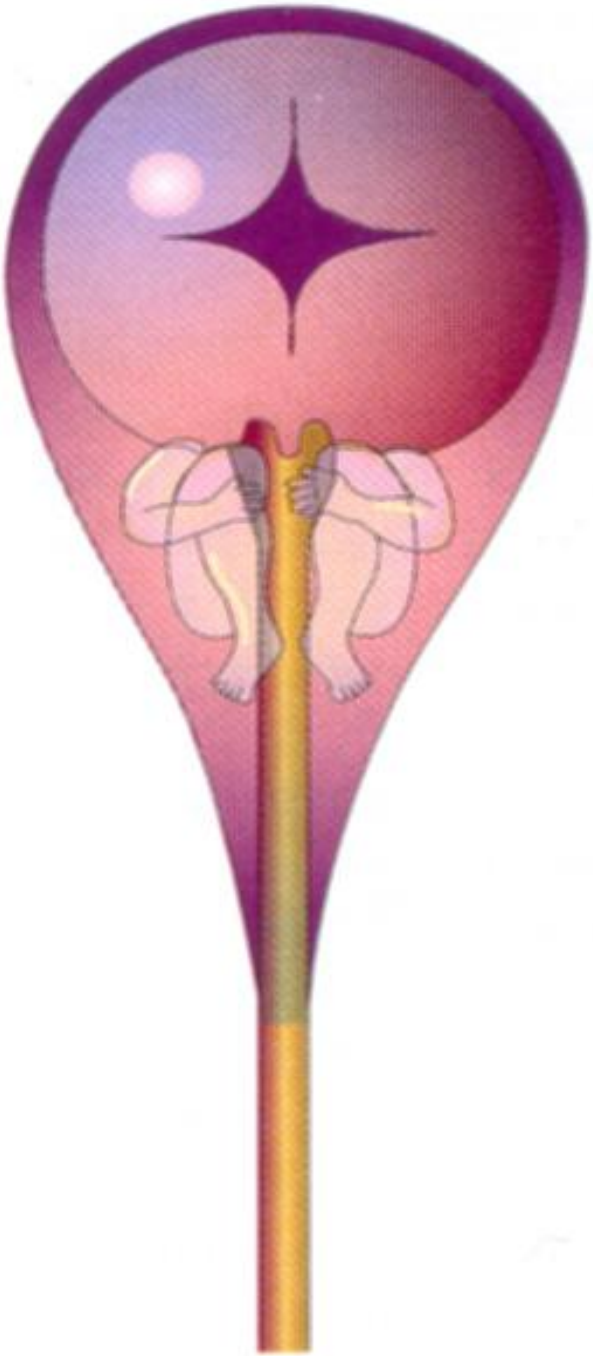
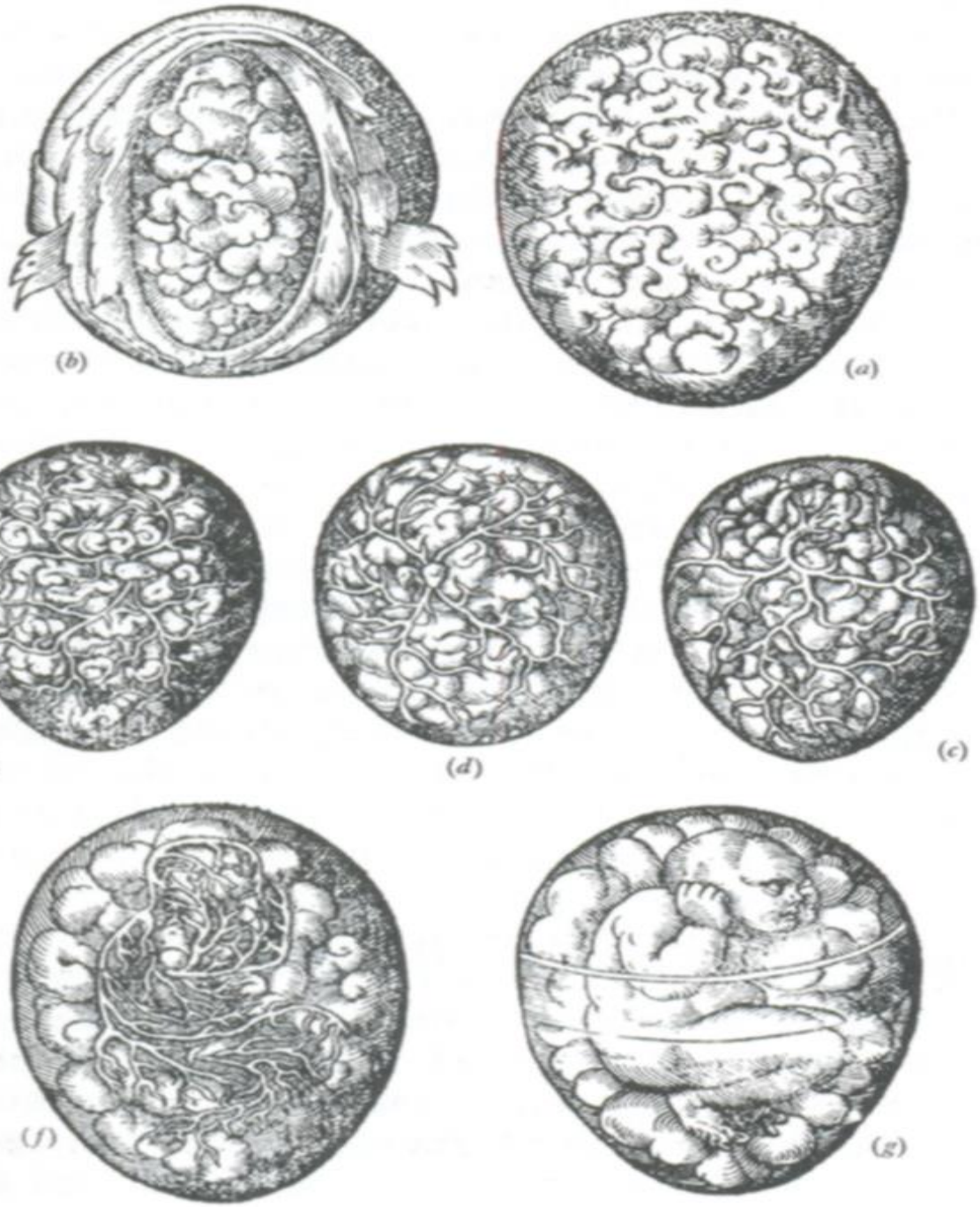
Life is a miracle

GENERAL EMBRYOLOGY

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(a)
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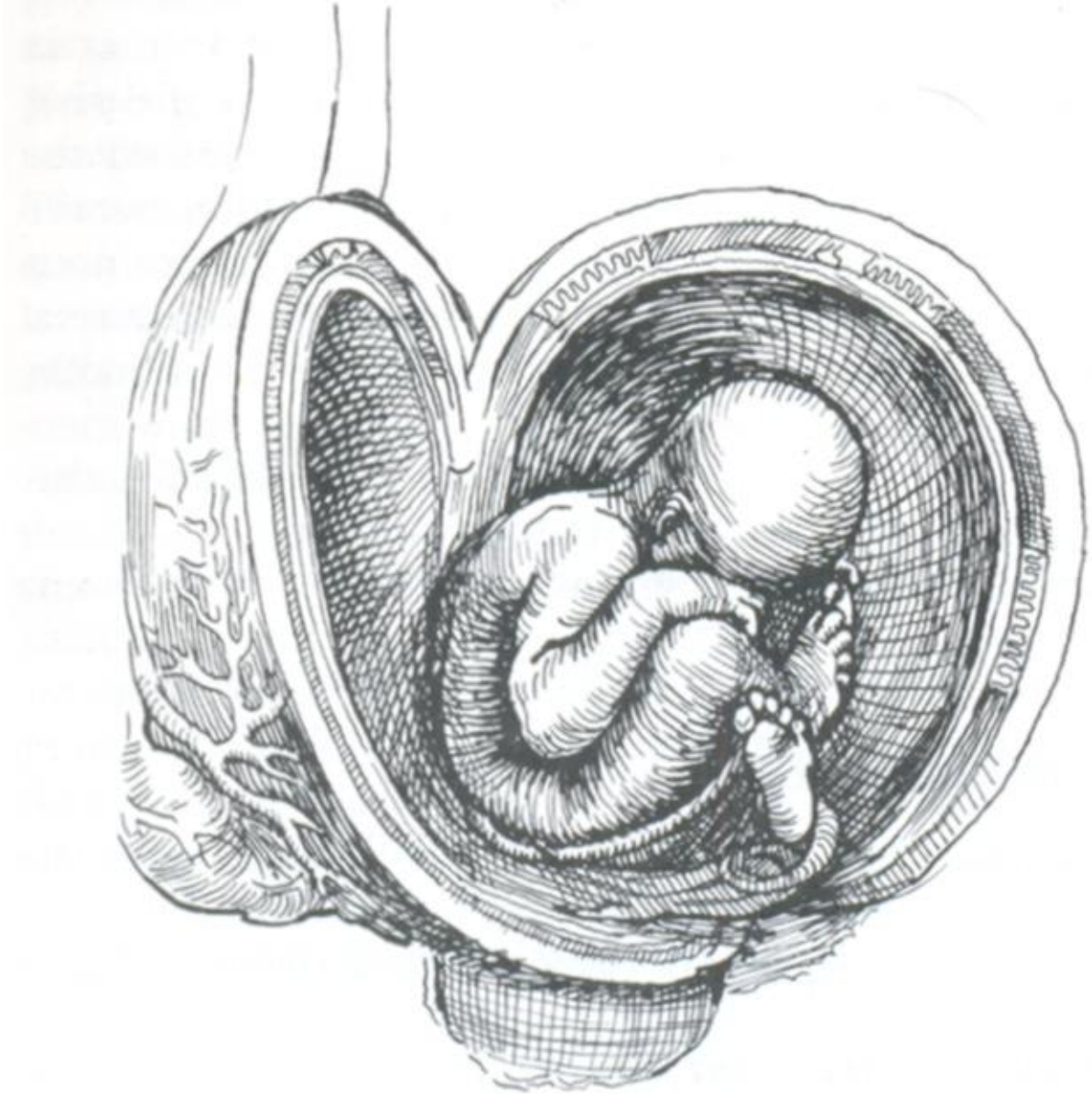


Gametogenesis

Spermatogenesis

Oogenesis

- Development begins with **fertilization**
- Fertilization – union of **Male** & **Female gametes**

  i.e. **spermatozoa** & **oocyte**
- Gametes are derived from **primordial germ cells**

  (PGCs)
- **PGCs** : formed in the **epiblast – 2nd wk** of gestation

  : move through **primitive streak** during gastrulation – 3rd wk

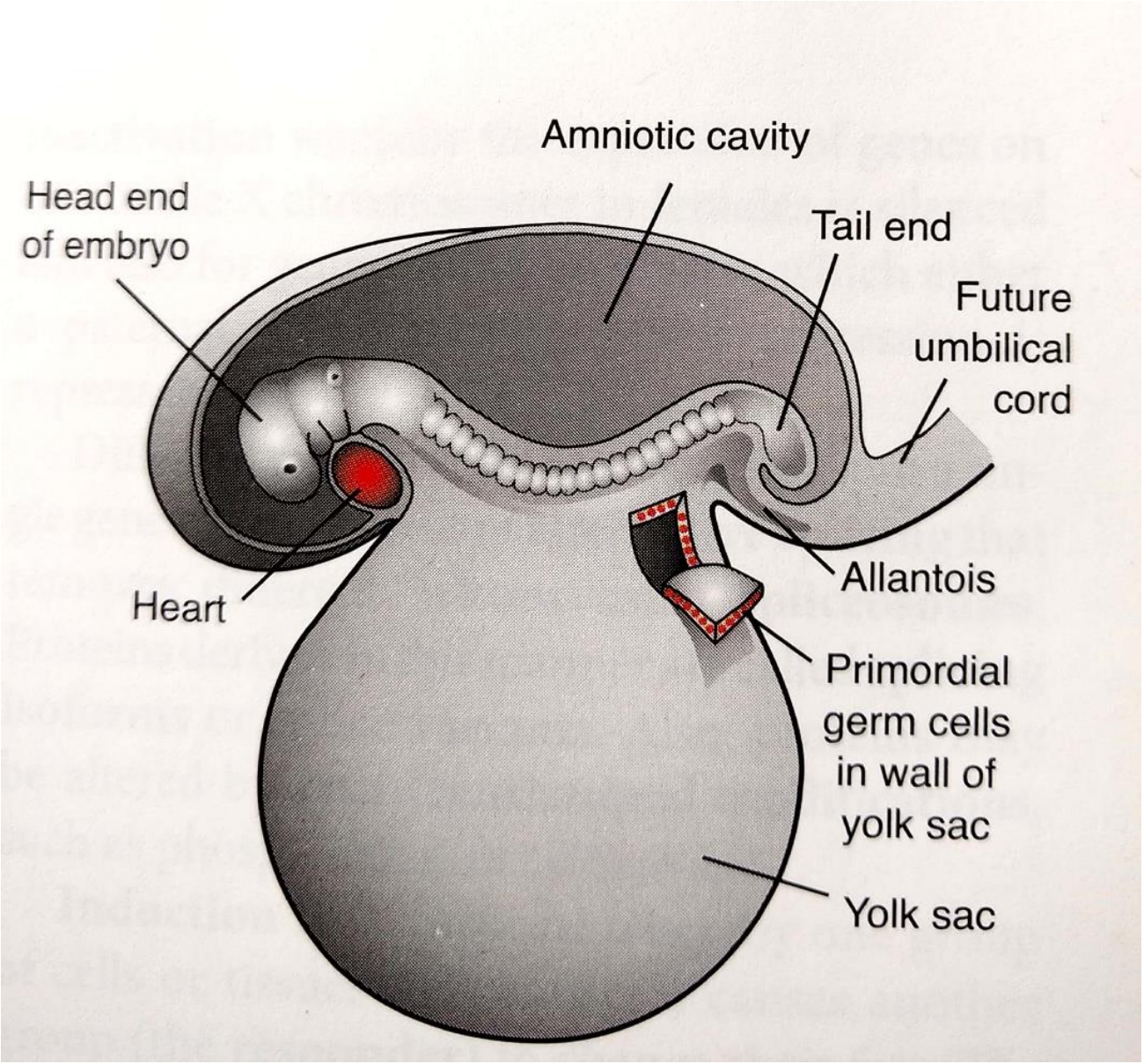
  : migrate to the **wall of yolk sac**

  : 4th wk **-** migrate towards developing gonads

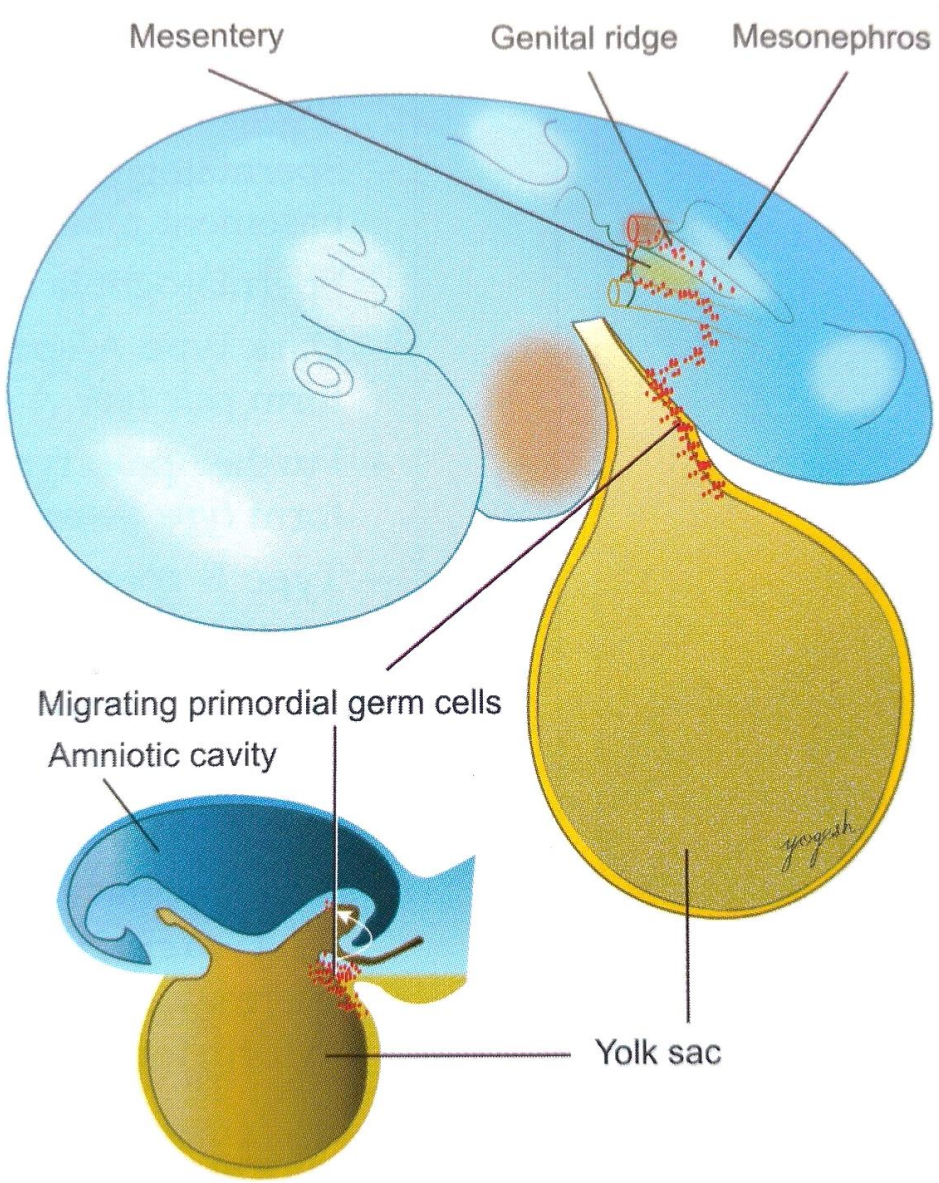
  : 5th wk – arrive at **developing gonads**

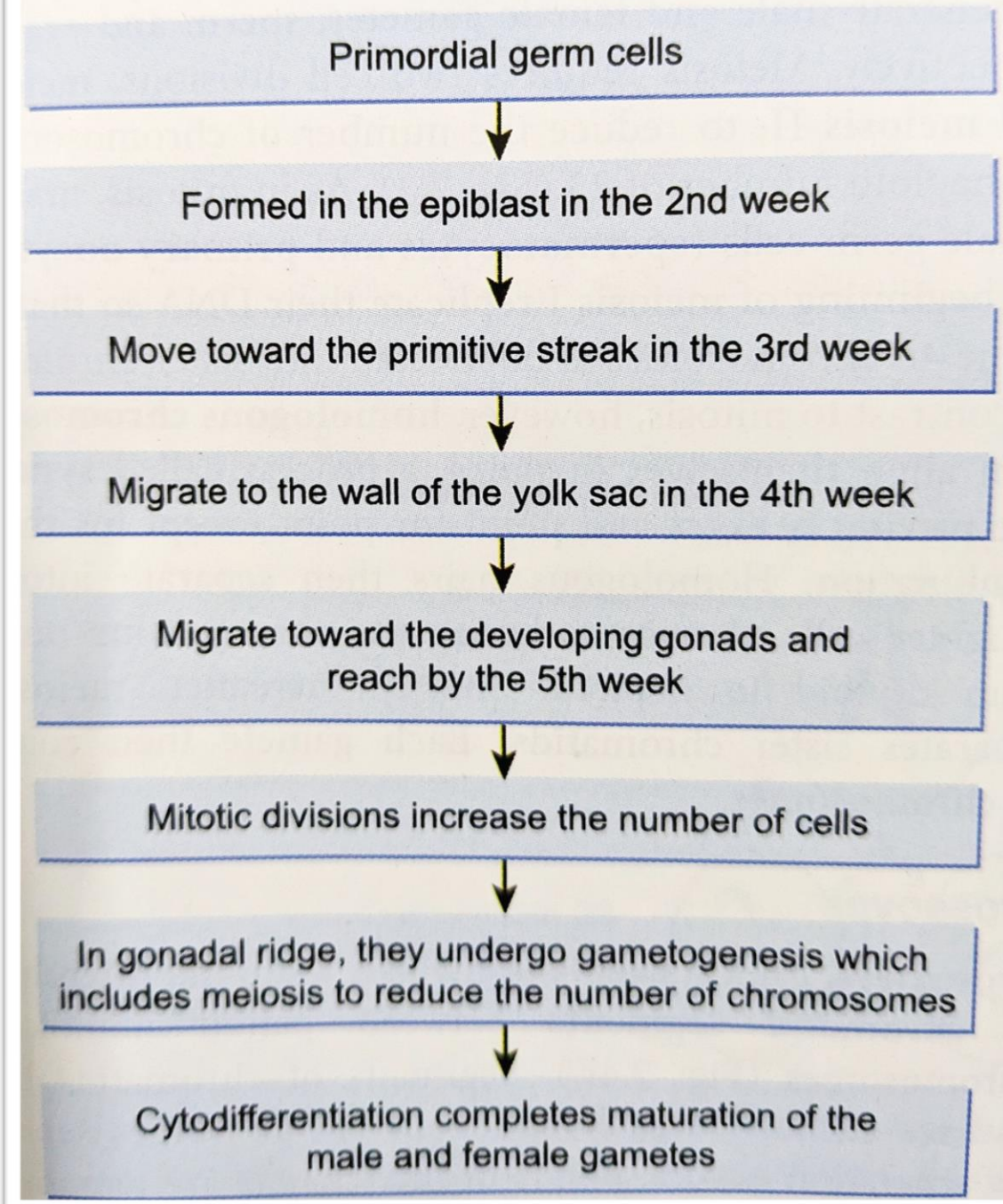
  : **mitotic division** increase the number

Embryo – 3 weeks



Migration of Primordial Germ Cells




Primordial germ cells
Formed in the epiblast in the 2nd week
Move toward the primitive streak in the 3rd week
Migrate to the wall of the yolk sac in the 4th week
Migrate toward the developing gonads and reach by the 5th week
Mitotic divisions increase the number of cells
In gonadal ridge, they undergo gametogenesis which includes meiosis to reduce the number of chromosomes
Cytodifferentiation completes maturation of the male and female gametes

At Birth

Sex cords of Testis have

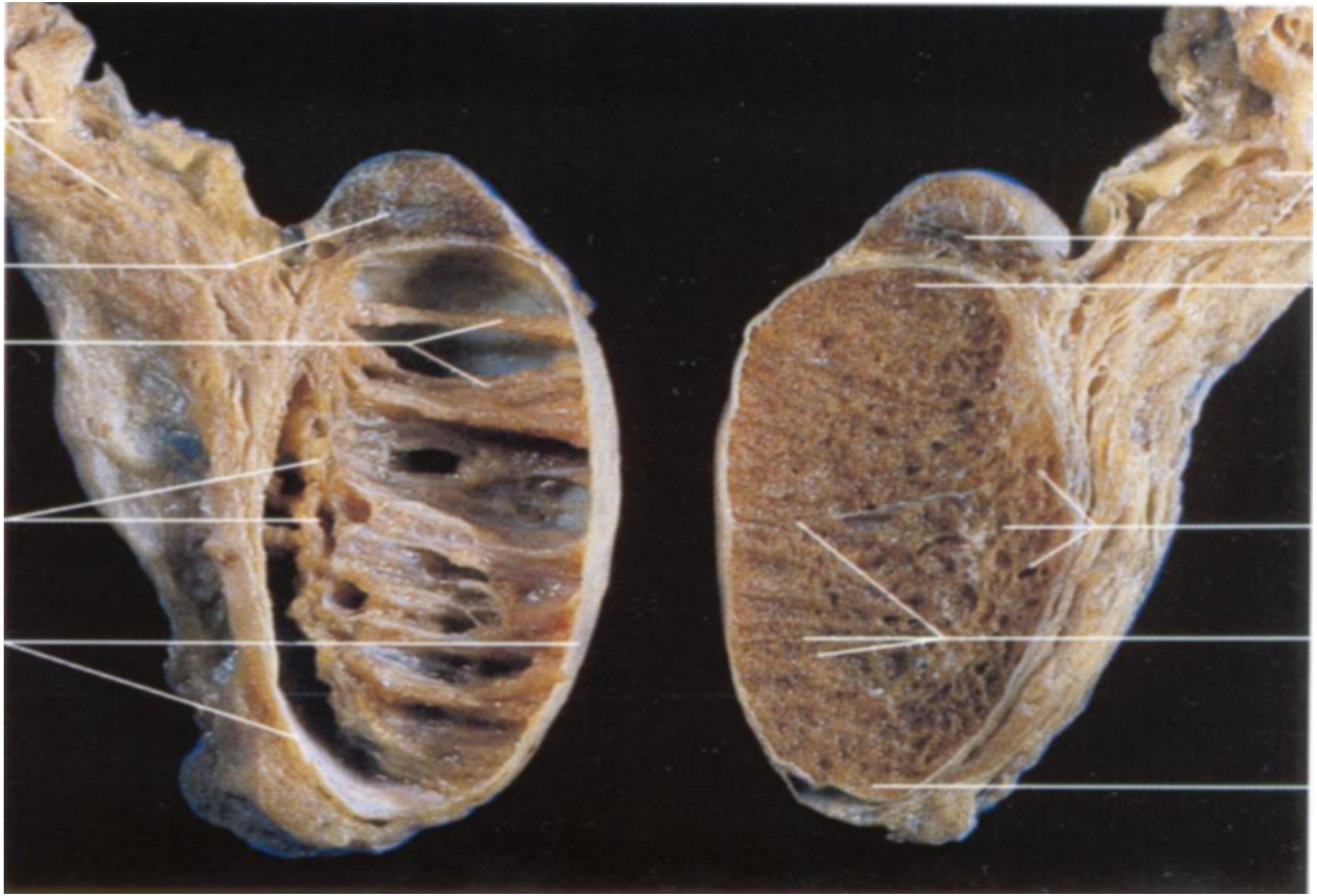
1) Primordial Germ cells

2) Cells of Sertoli

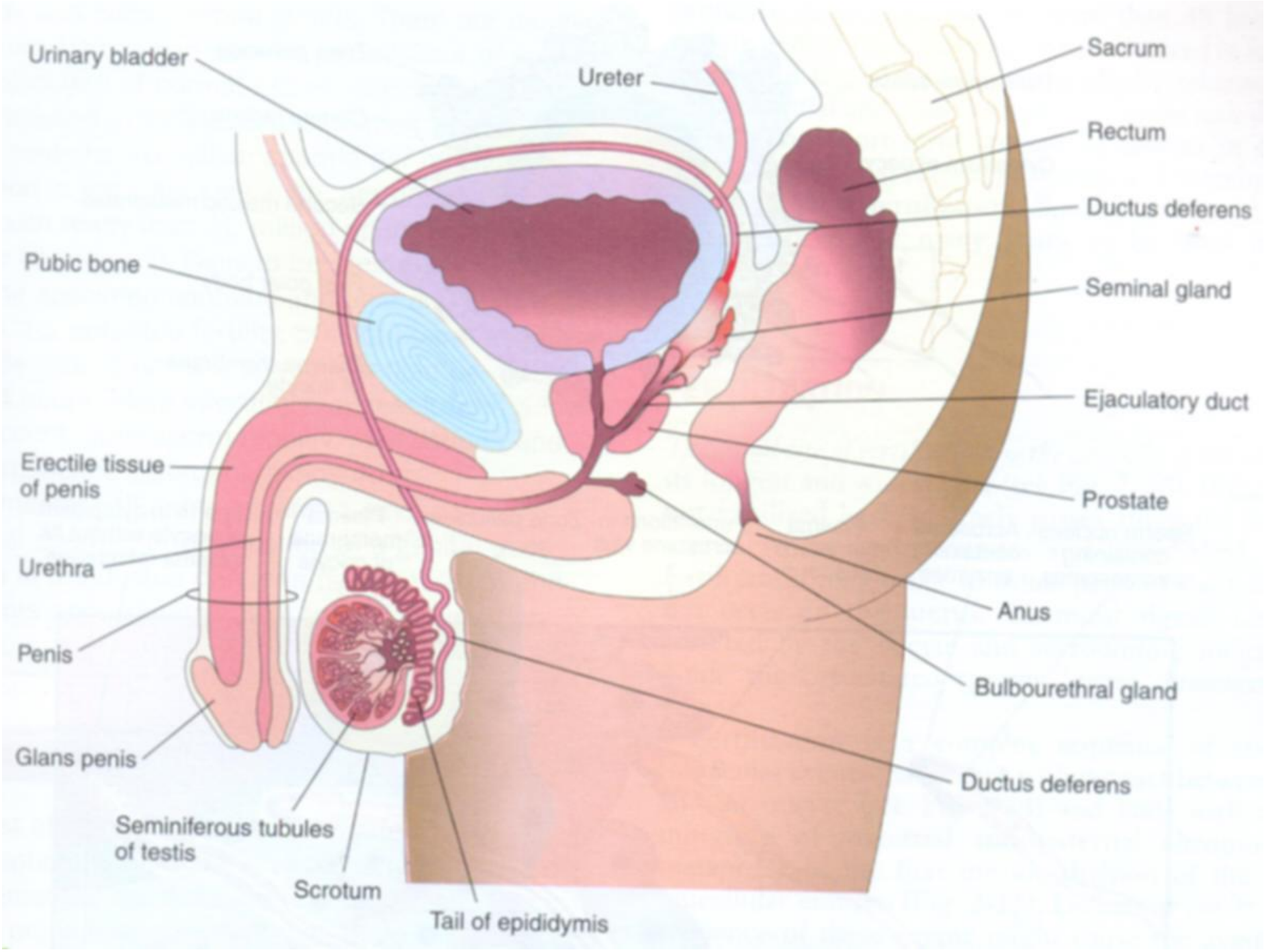
Sex cords acquire lumen just before Puberty

Maturation begins at Puberty

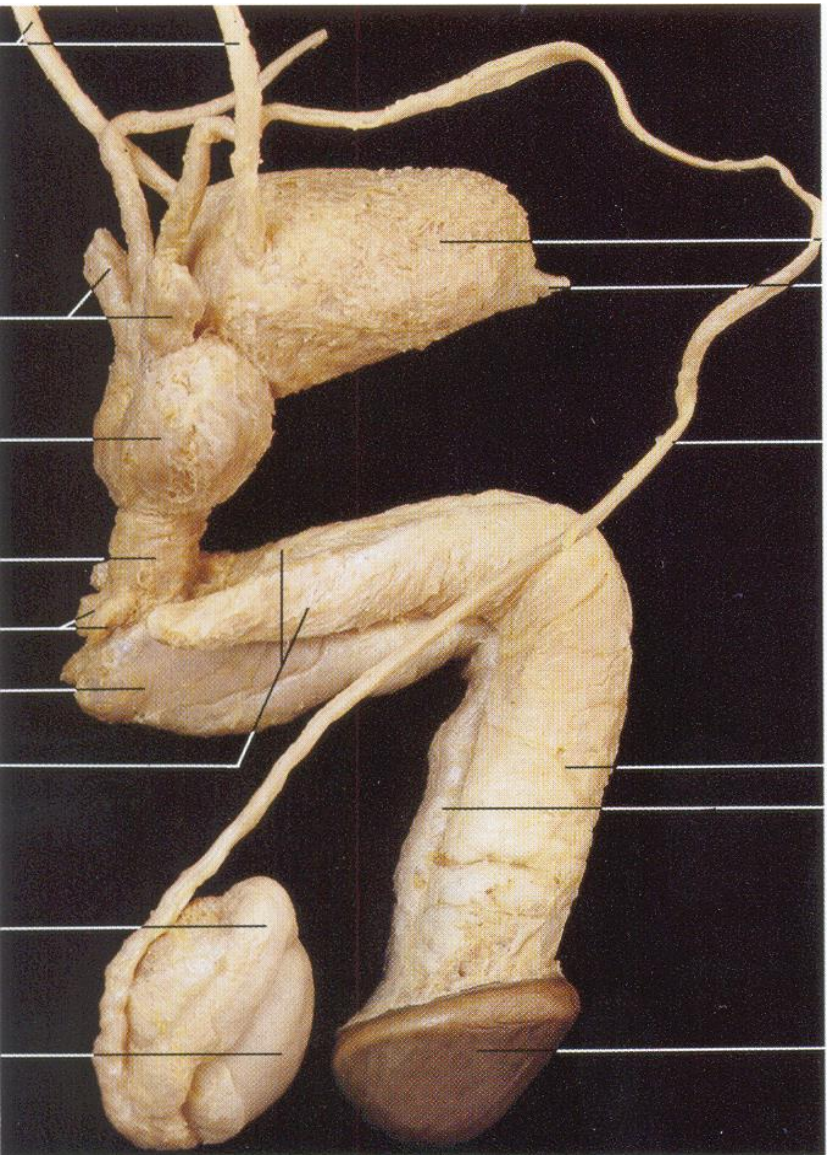
Testis-Interior, Spermatic cord



Male Pelvis –Sagittal Section


Urinary bladder
Ureter
Sacrum
Rectum
Ductus deferens
Pubic bone
Seminal gland
Ejaculatory duct
Erectile tissue of penis
Prostate
Urethra
Anus
Penis
Bulbourethral gland
Glans penis
Ductus deferens
Seminiferous tubules of testis
Scrotum
Tail of epididymis

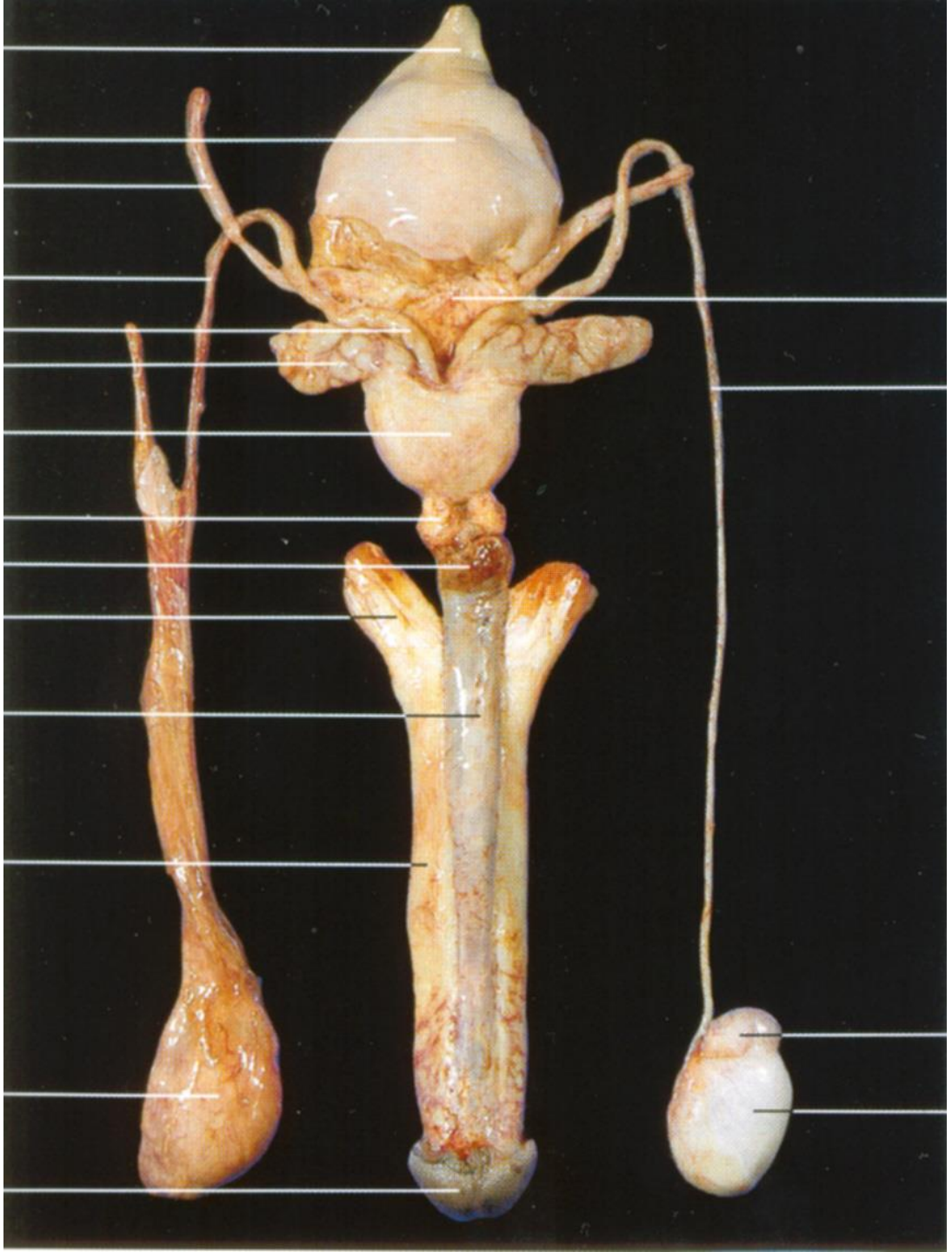
Male Reproductive System



Secretory- Gonads –Testis (Spermatozoa)

Conducting Epididymis
Vas deferens
Ejaculatory Duct
Urethra

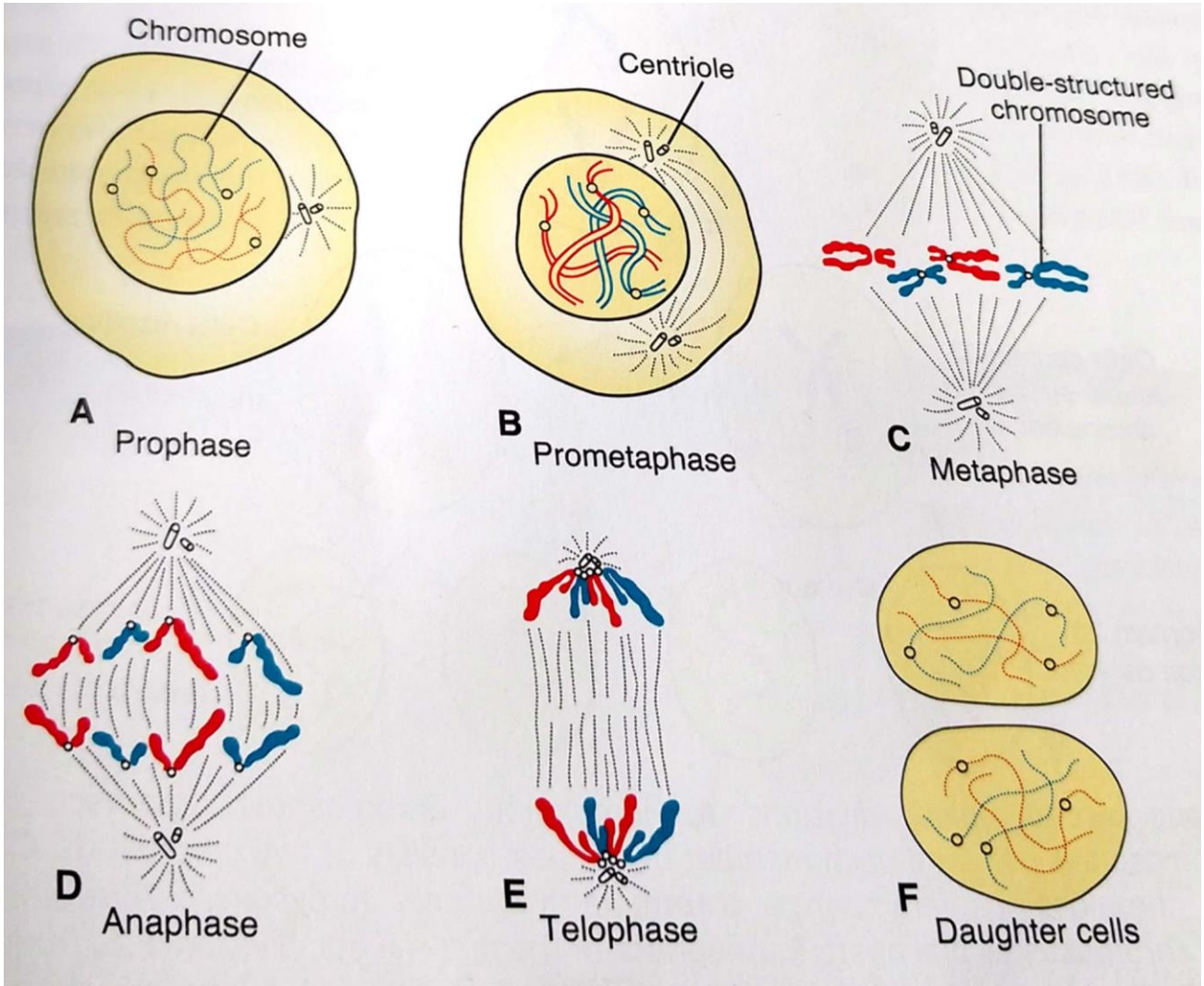
Associated glands
Seminal Vesicles
Prostate,
Bulbourethral glands



- Right -Testis- with Spermatic cord
- Left—Testis with Epididymis,Vas.def
- Bladder with ureters
- Seminal vesicles
- Prostate
- Penis

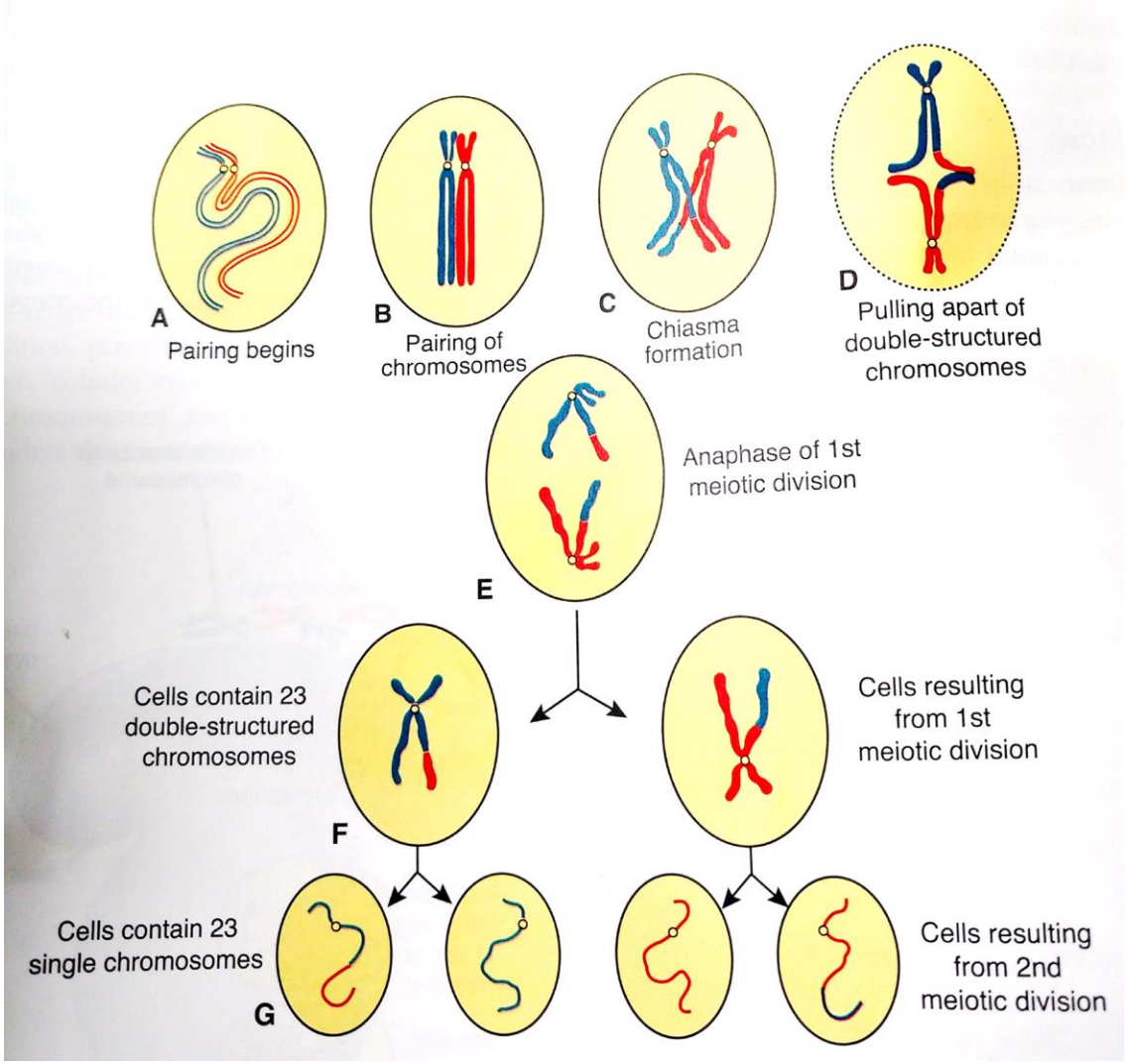
Mitosis

A process whereby **one cell divides**, giving rise to **two daughter cells** that are **genetically identical to parent cell**



Meiosis

A process that takes place in **germ cells**, requires **two cell divisions**, to **reduce the no. of chromosomes to haploid** no. of 23



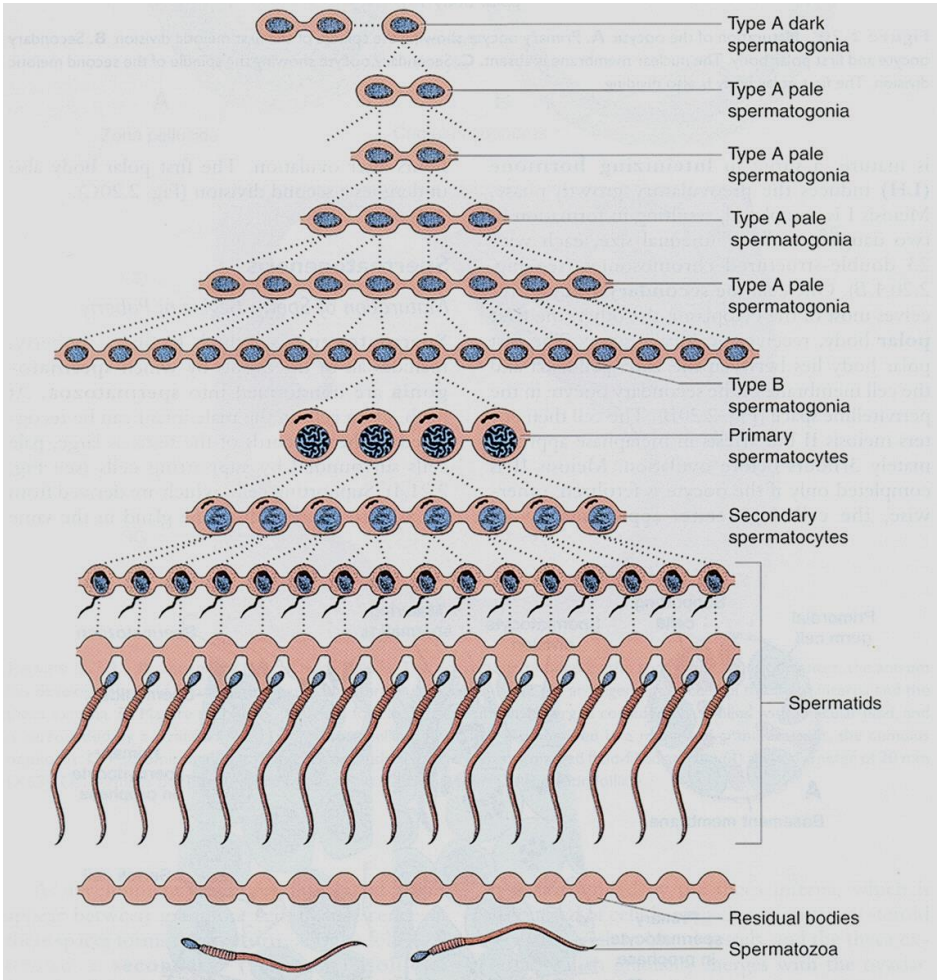
Result of Meiosis

- **Genetic variability** is enhanced through
  - Crossover, which redistributes genetic material
  - Random distribution of homologous chromosomes to the daughter cells
- Each germ cell contains a haploid no. of chromosomes so that at fertilization,

  the diploid no. of 46 is restored

Spermatogenesis – 74 days

Begins at Puberty & continues till old age

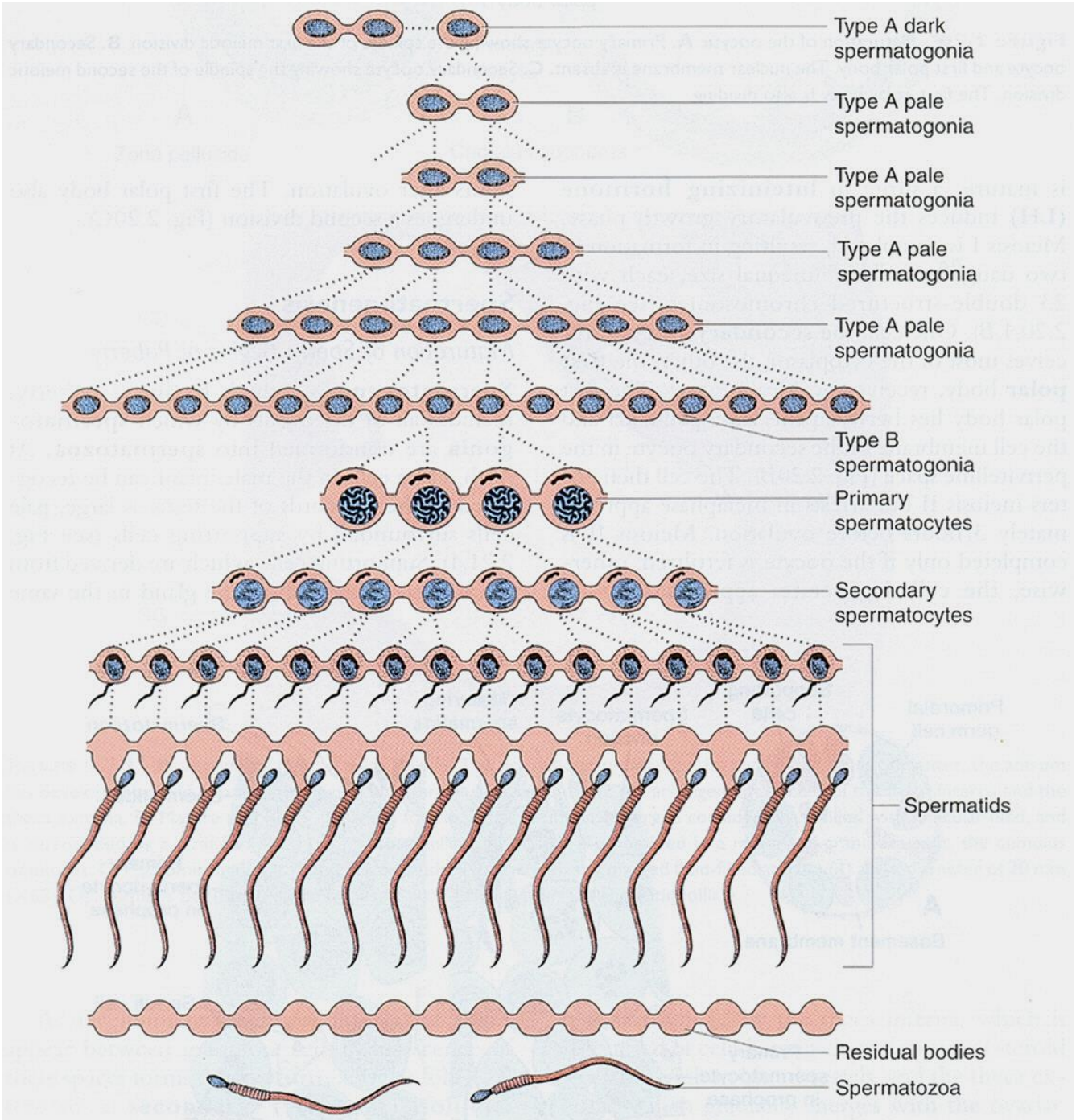


- **Primordial Germ Cells**
- **Spermatogonia**

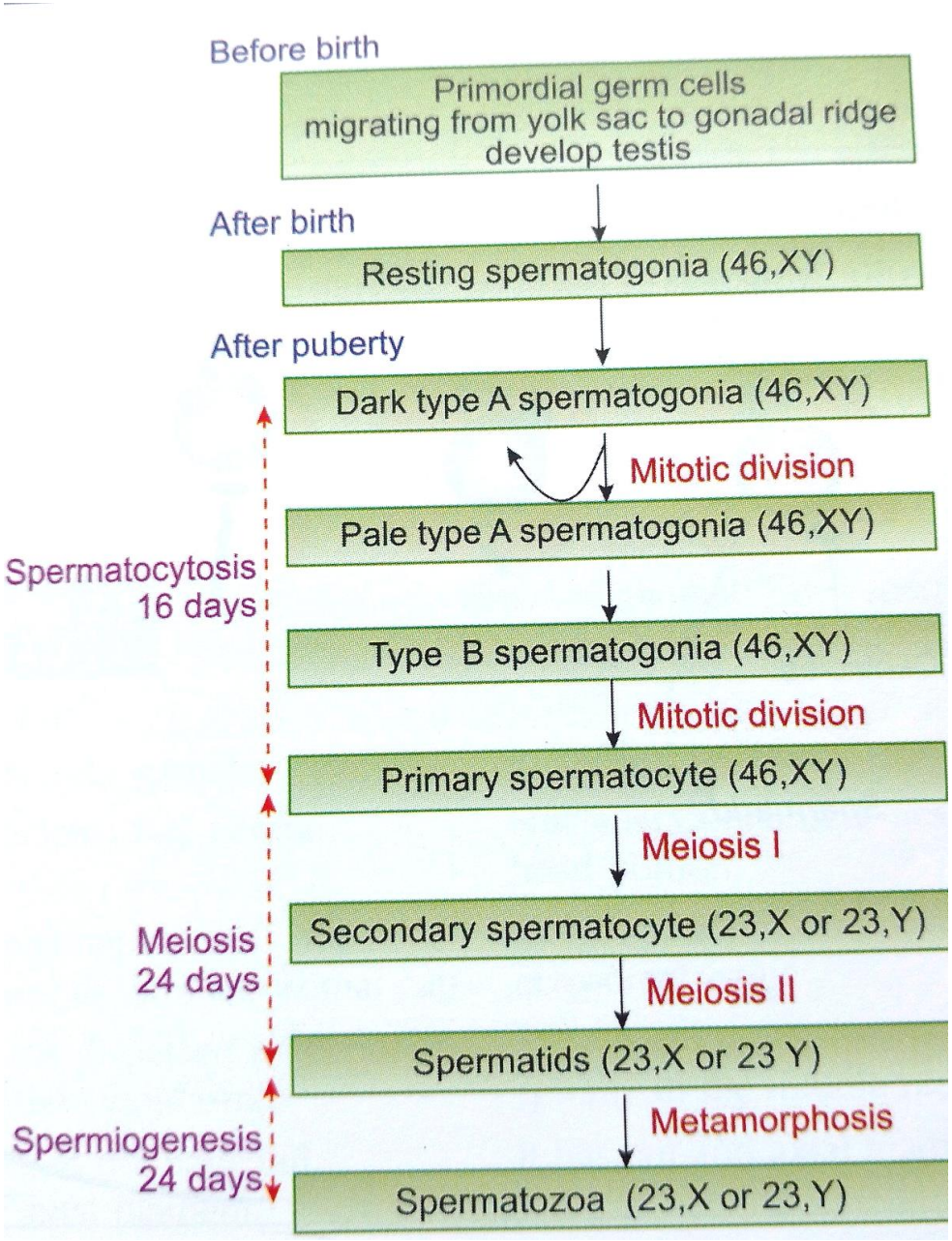
  A-dark –Stem cells
- **A-pale**
- **Spermatogonia B**
- **I ry Spermatocyte**

  Meiosis I
- **II ry Spermatocyte**

  Meiosis II
- **Spermatid**

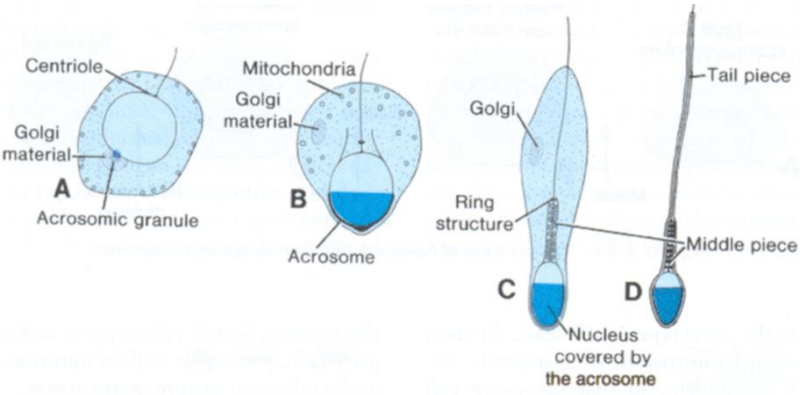

Type A dark spermatogonia
Type A pale spermatogonia
Type A pale spermatogonia
Type A pale spermatogonia
Type A pale spermatogonia
Type B spermatogonia
Primary spermatocytes
Secondary spermatocytes
Spermatids
Residual bodies
Spermatozoa

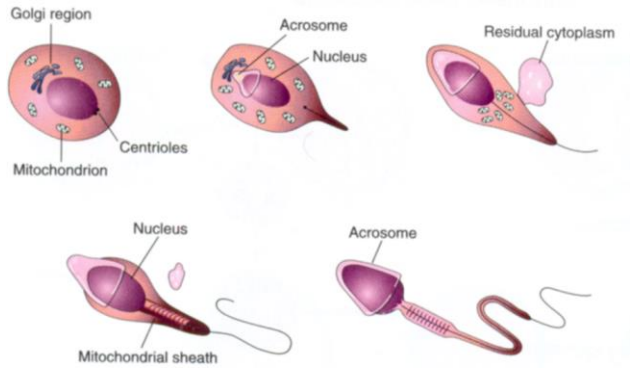
Spermatogenesis



Spermiogenesis

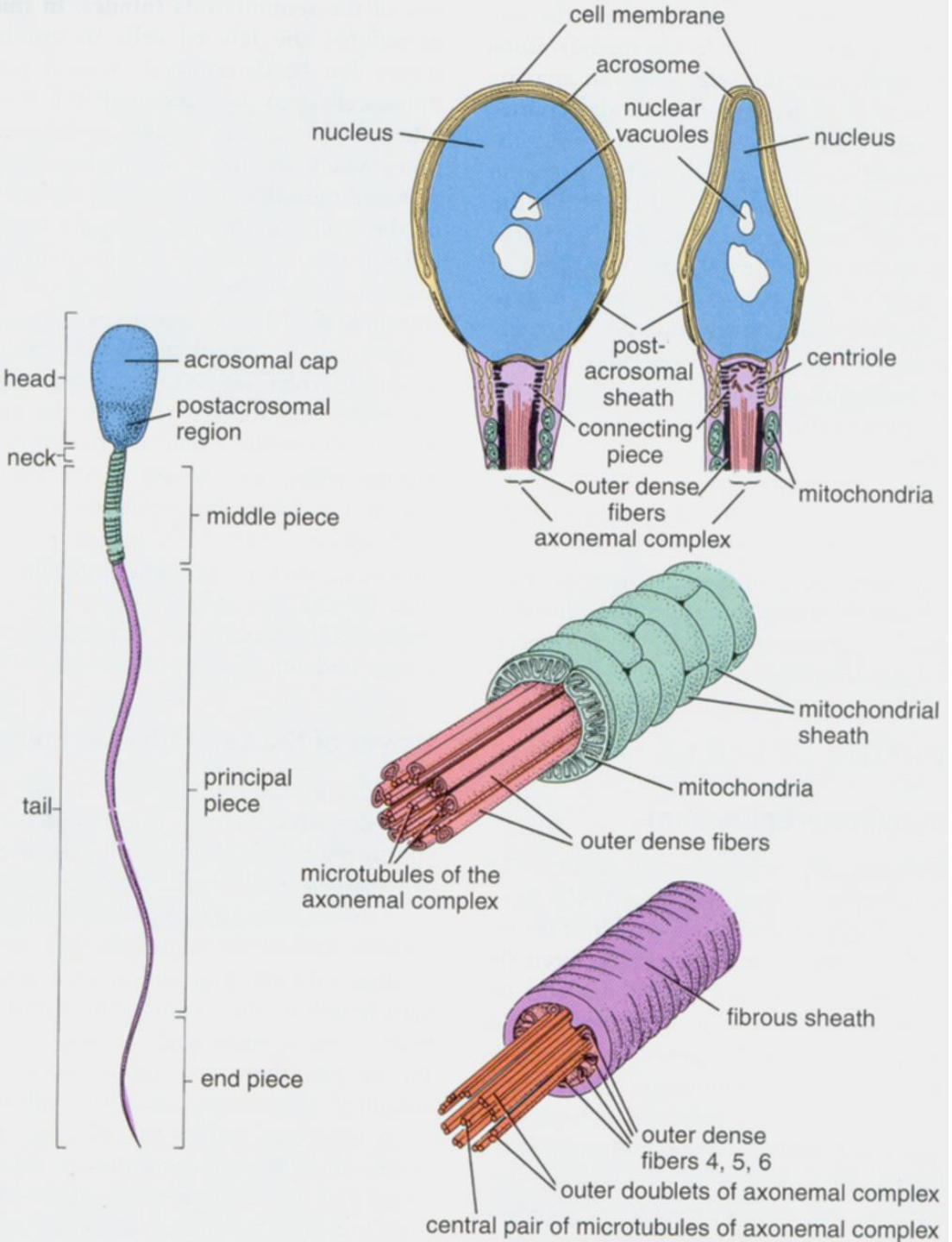
Spermatid → Spermatozoon

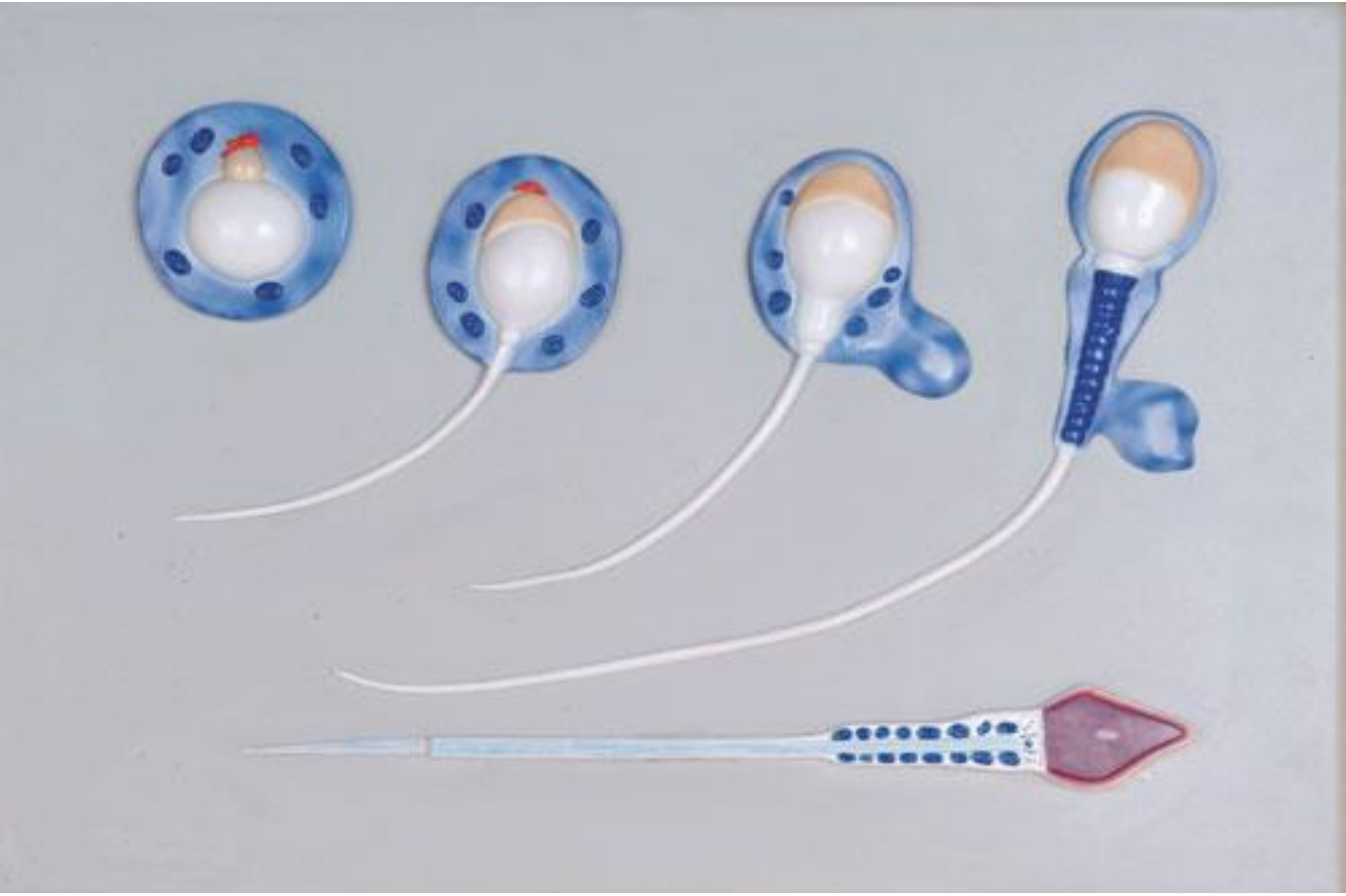




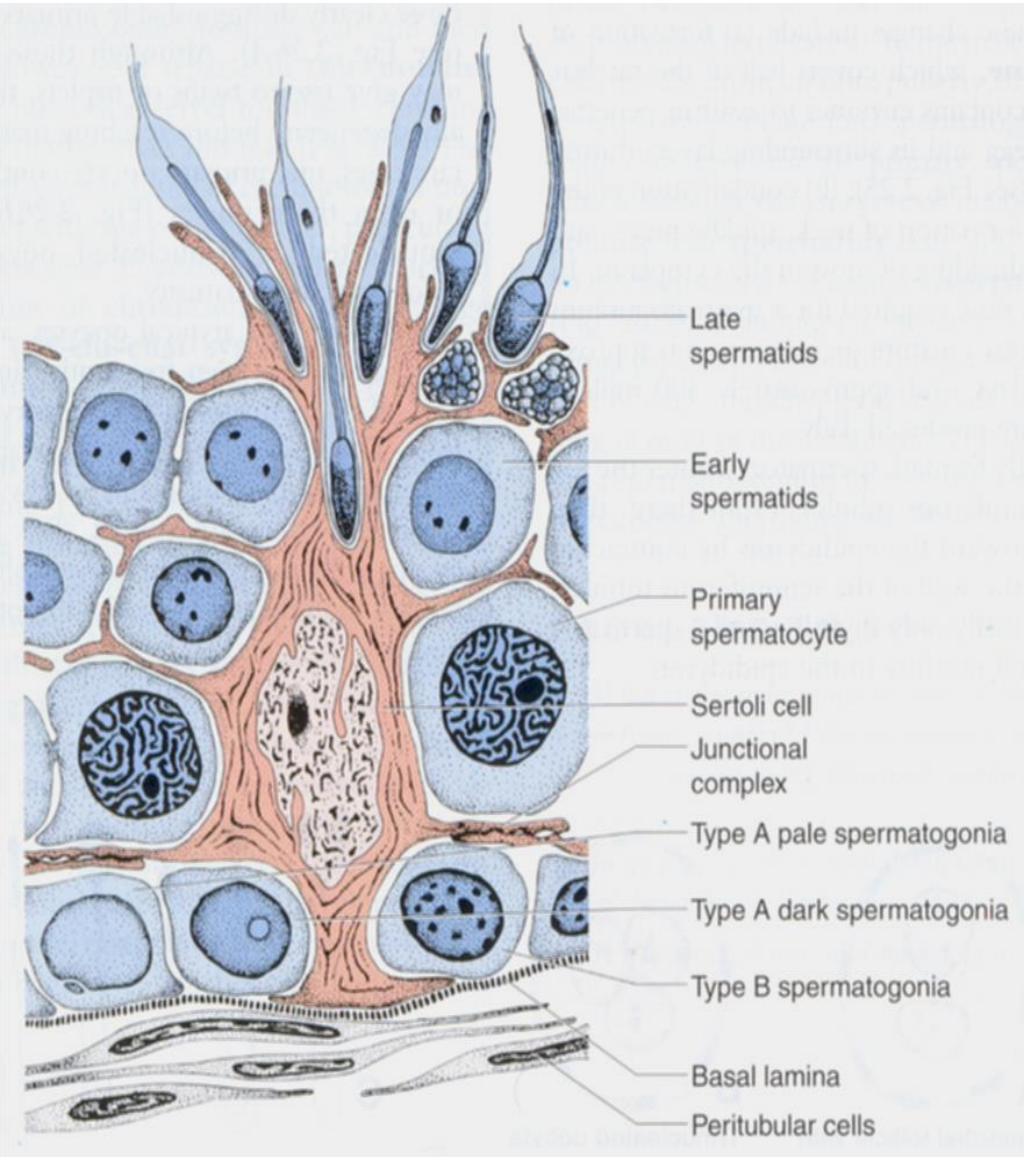
1. Nucleus condensation
2. Acrosome formation : covers half of nuclear surface,

   : enzymes assist penetration of egg & its surrounding layers during fertilization
3. Shedding of cytoplasm
4. Formation of head, neck, middle piece, principal piece & tail
5. Free swimming
6. Gain motility – epididymis


cell membrane
acrosome
nuclear vacuoles
nucleus
nucleus
post-acrosomal sheath
centriole
connecting piece
outer dense fibers
axonemal complex
mitochondria
head
acrosomal cap
postacrosomal region
neck
middle piece
tail
principal piece
end piece
mitochondrial sheath
mitochondria
outer dense fibers
microtubules of the axonemal complex
fibrous sheath
outer dense fibers 4, 5, 6
outer doublets of axonemal complex
central pair of microtubules of axonemal complex



Sertoli Cell



- **Support**

  Throughout the development from Spermatogonia to Spermatids-

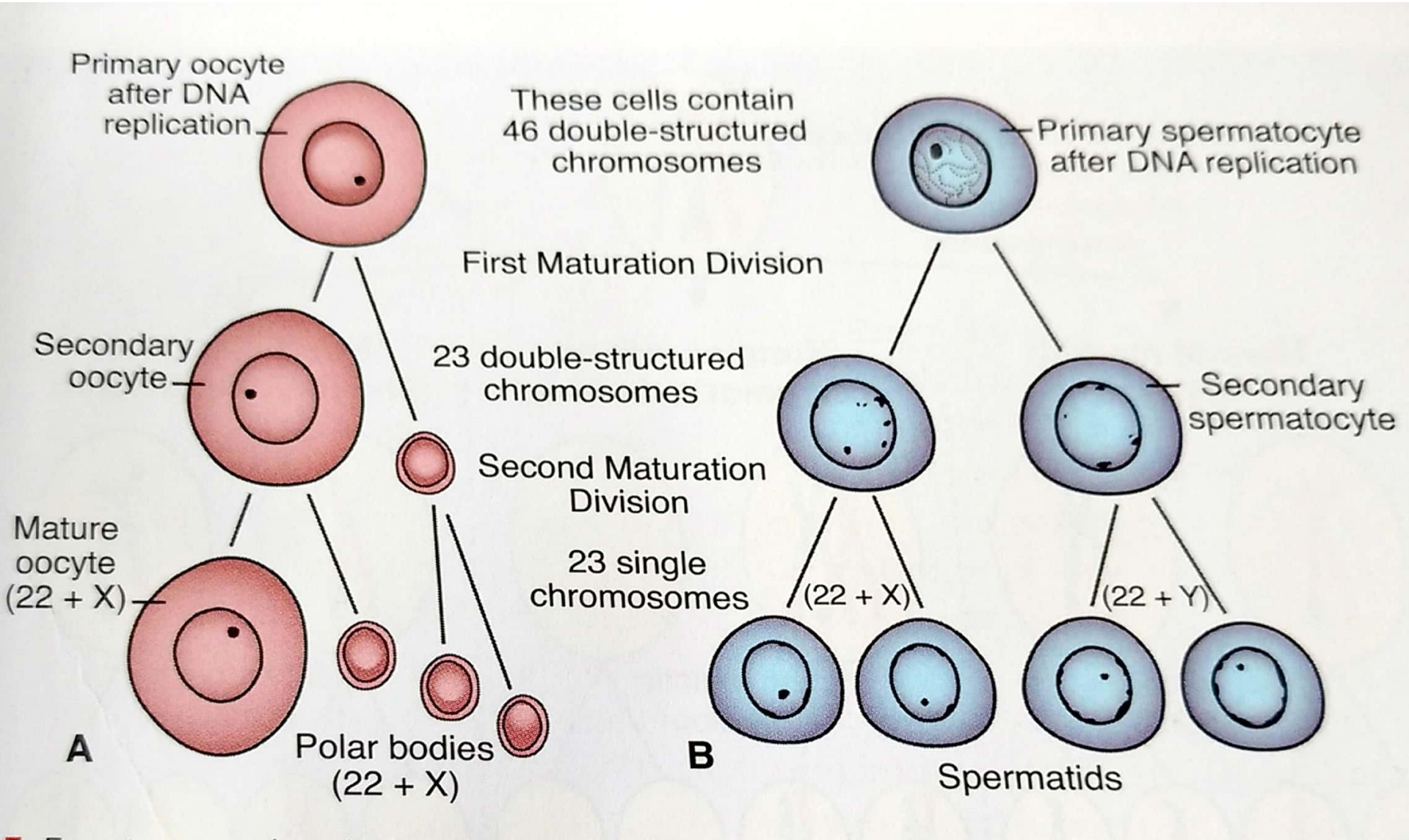
Cells are embedded in the deep recesses of Sertoli cells

Sertoli Cell

Functions

- Protection
- Nutrition
- Assist in Release of Sperms
- Release of hormone for maturation of the sperms
- Phagocytosis of residual bodies
- Blood testis Barrier

Spermatogenesis & oogenesis



SEMEN-Seminal Fluid

- Semen- **10% sperms**
  90% fluids --60% -Seminal vesicle,
  30%- Prostate,
  10% - Bulbo-Urethral glands
- 100-300 million /ml
- Proteolytic Enzymes, Sugars, Prostaglandins
- Fluid secretion is from-Testes, Epididymis, prostate Seminal Vesicle, Bulbourethral glands

Anomalies

Normal Sperm Count- 200-600 million/ejaculate

- **Abnormal count**

  Oligo-zoospermia - Less sperm count

  Azoospermia - No sperms

- **Abnormal motility**

  Less Motility--40% sperms have to be motile

- **Abnormal Morphology**

  1) Cytoplasmic bridges

  2) Double head

Male Infertility

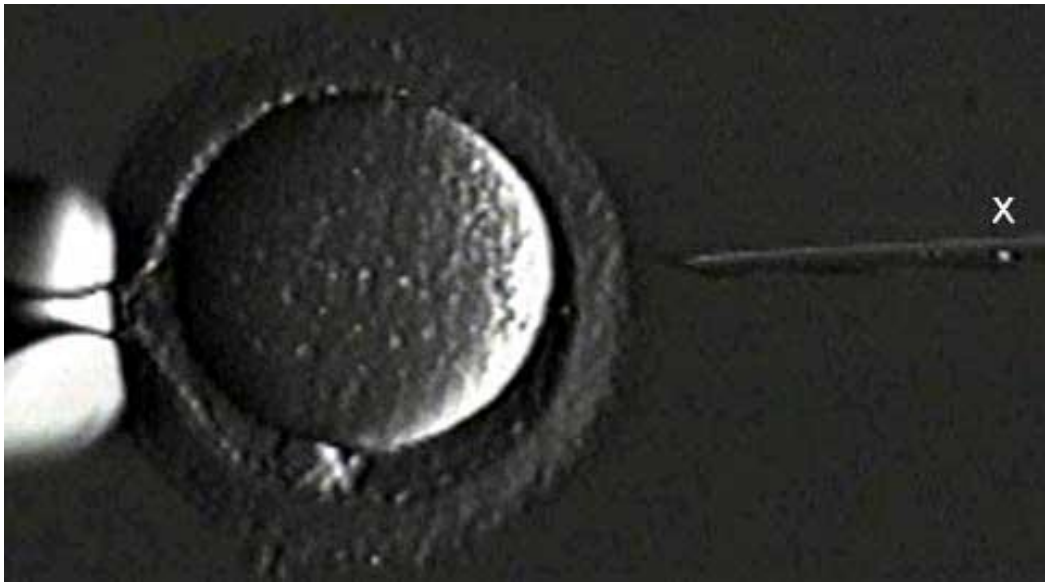
- **Genetic** Disorders – Klinefelter syndrome
- **Endocrine** Disorders
- Abnormal Spermatogenesis
- Obstruction of Ductus Deferens

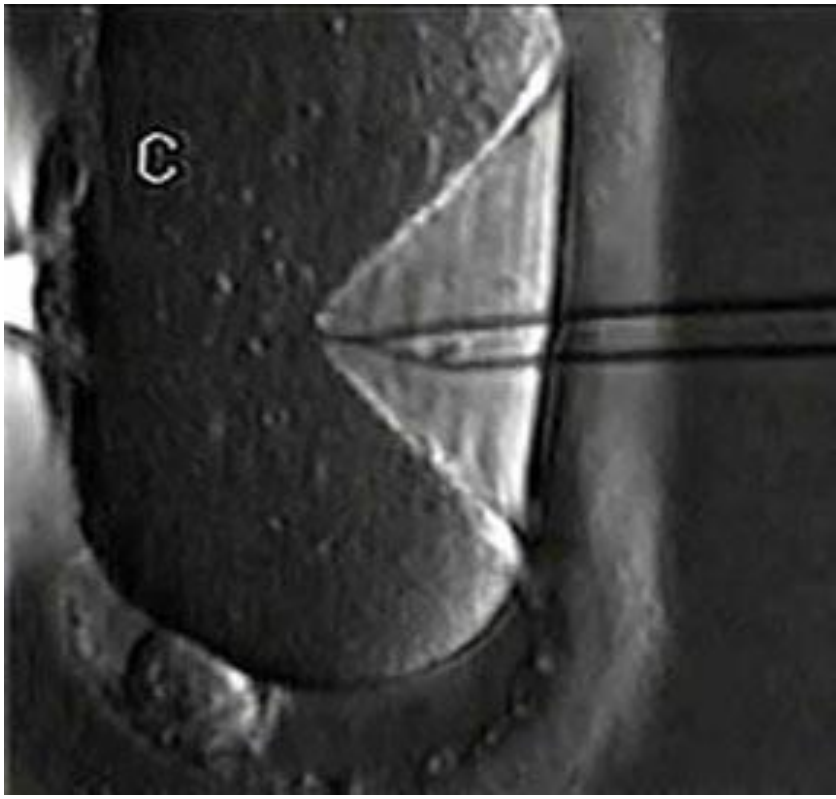
Clinical Correlates

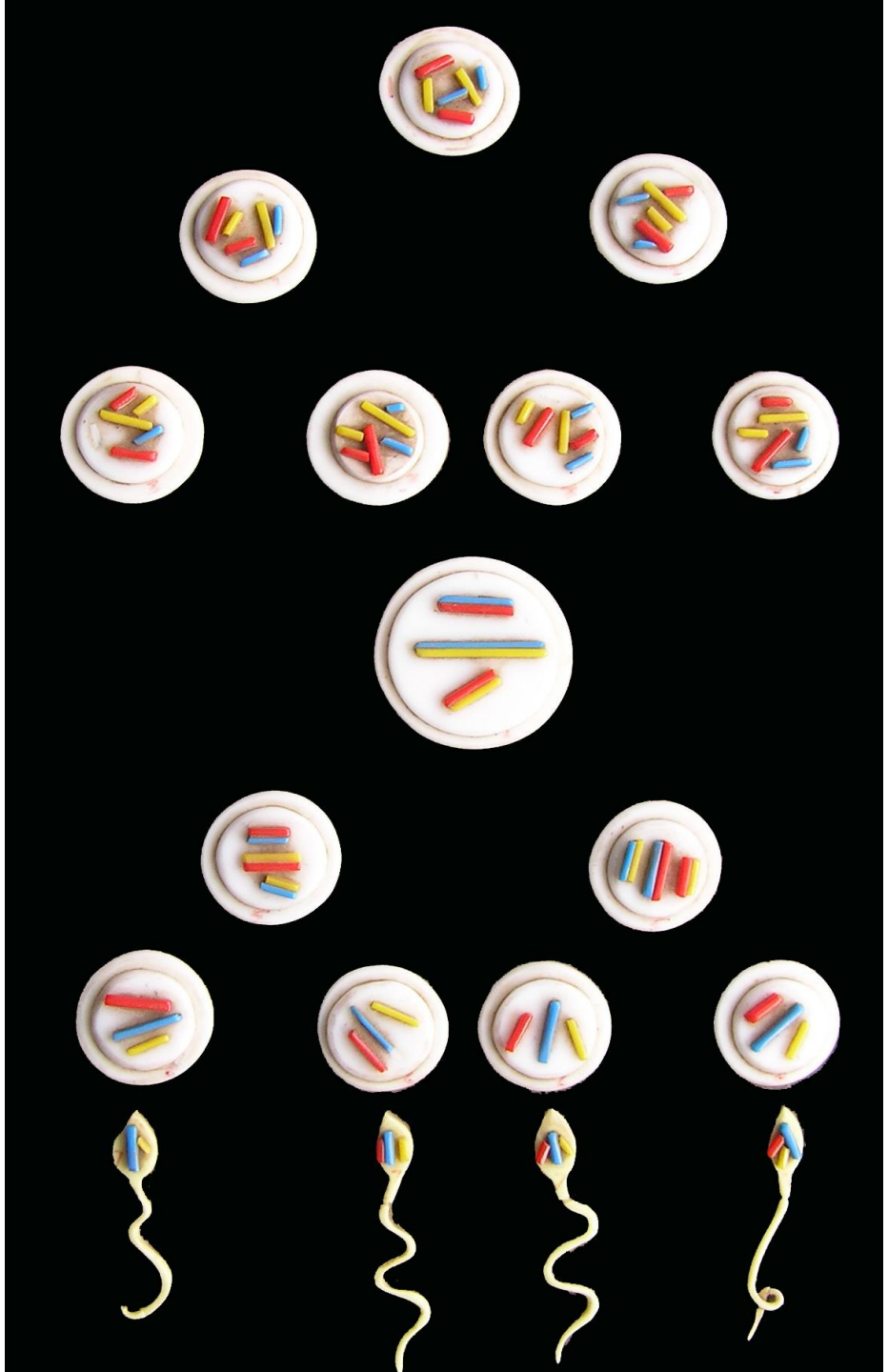
- **Vasectomy -** reversible in 50%
- **Cryopreservation -** at **-70 C**
- **Non viable after 48 hrs in Female Genital Tract**
- **ICSI - I**ntra **C**ytoplasmic **S**perm **I**njection- oligospermia

I.C.S.I

Intra **C**ytoplasmic **S**perm **I**njection







- Spermatogonium
- **A**-Dark-stem cells,
- **A**-Light
- **B-** Spermatogonia

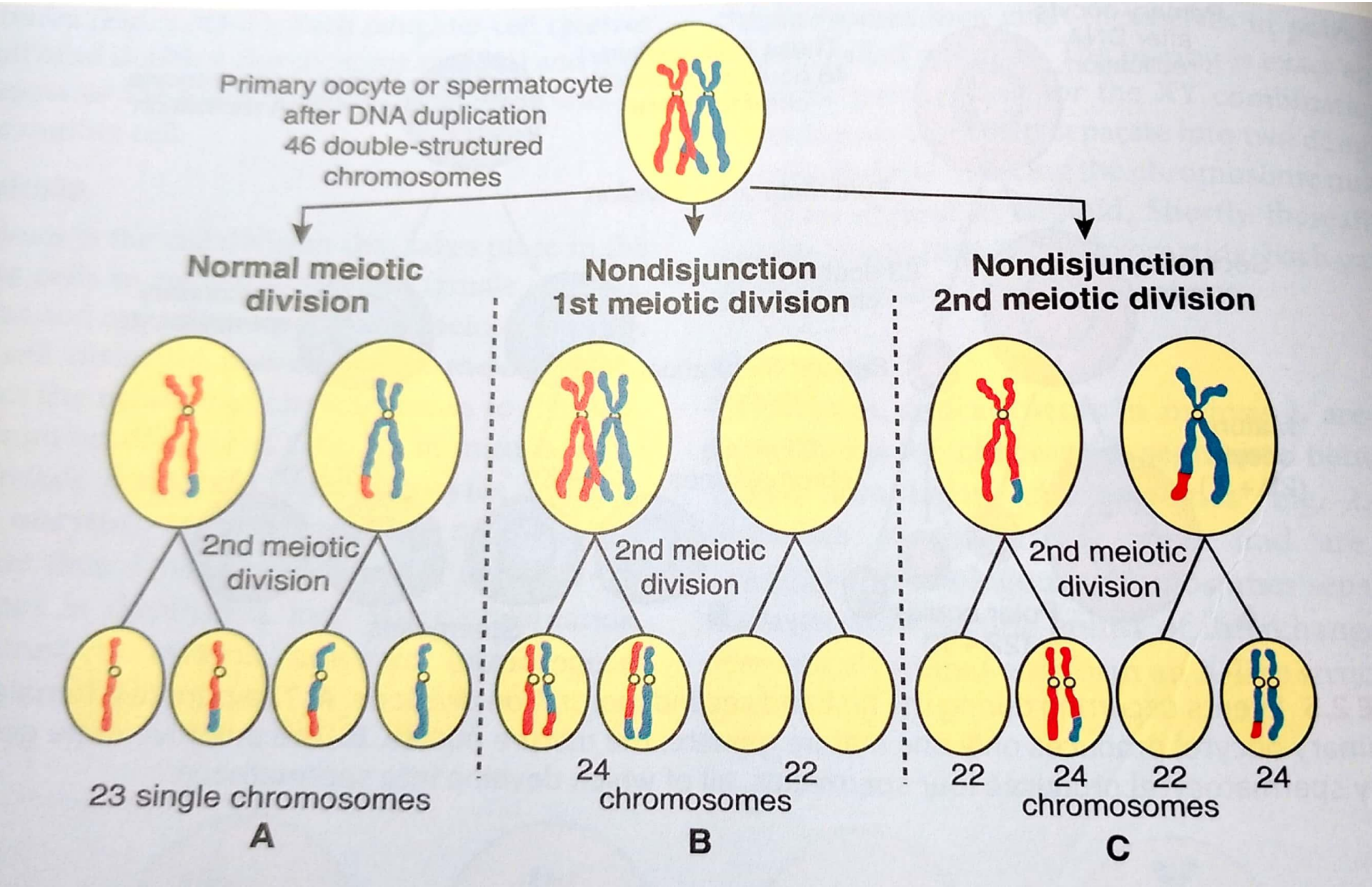
- Primary Spermatocyte
- Secondary spermatocyte
- Spermatids

- Spermatozoa

Spermatogenesis

- What it is – **Definition**
- Where it takes place **- Site**
- How many days are required – **Duration**
- How it takes place – **Steps involved**
- **Clinical aspect**

Meiosis : Normal & Abnormal



Thank You