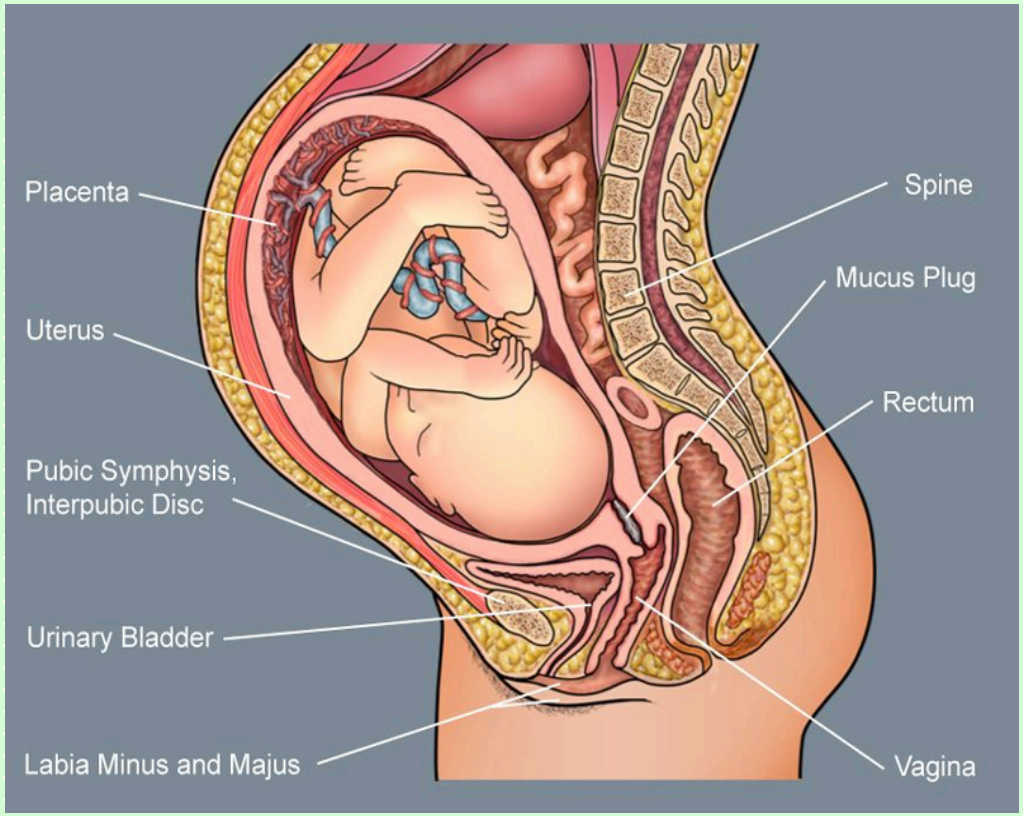
The Reproductive System



HUMAN DEVELOPMENT

Stages of Human Development

- Sexual reproduction occurs when an **ovum** becomes fertilized by a **spermatozoan**. During fertilization, the genetic material from the ovum is fused with that of the spermatozoan.
  - Two haploid cells were created by meiosis, each containing half of the genetic information needed in a diploid cell.
- Together, they form a **zygote**. This is a new cell which contains all of the genetic material necessary to grow.
  - The zygote, as it grows, will multiply by mitosis and transfer its DNA to the rest of the organism.

Spermatozoan + ovum = zygote

and

Haploid + haploid = diploid

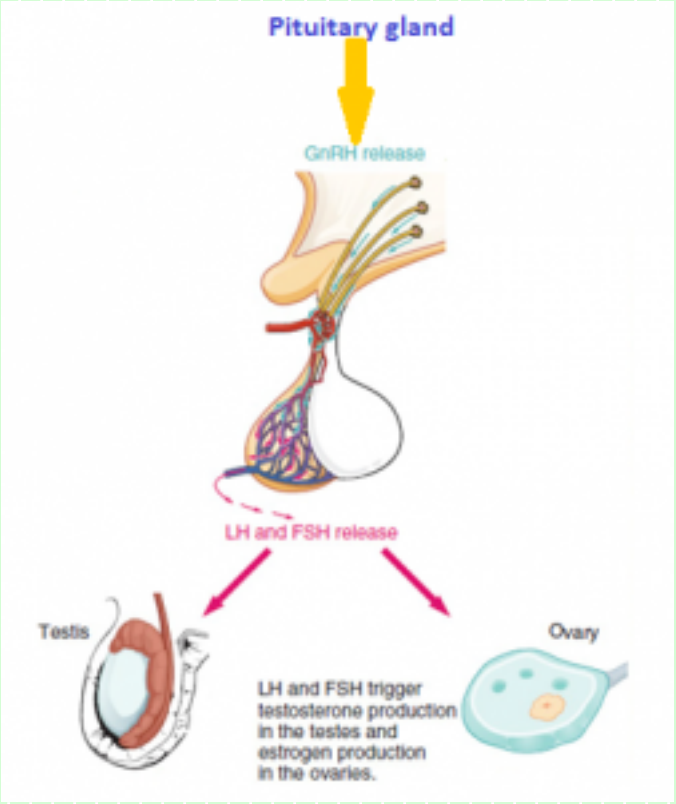
	Stage	Age
Pregnancy	Zygote	Fertilization – 2 weeks
	Embryo	2 – 9 weeks
	Fetus	9 weeks – birth
Stages after birth	Baby	Birth – 2 years
	Early Childhood	2 – 6 years
	Childhood	6 – 10 years
	Adolescence	10 – 18 years
	Adulthood	18 – 70 years
	Old Age	70 years - death

Puberty

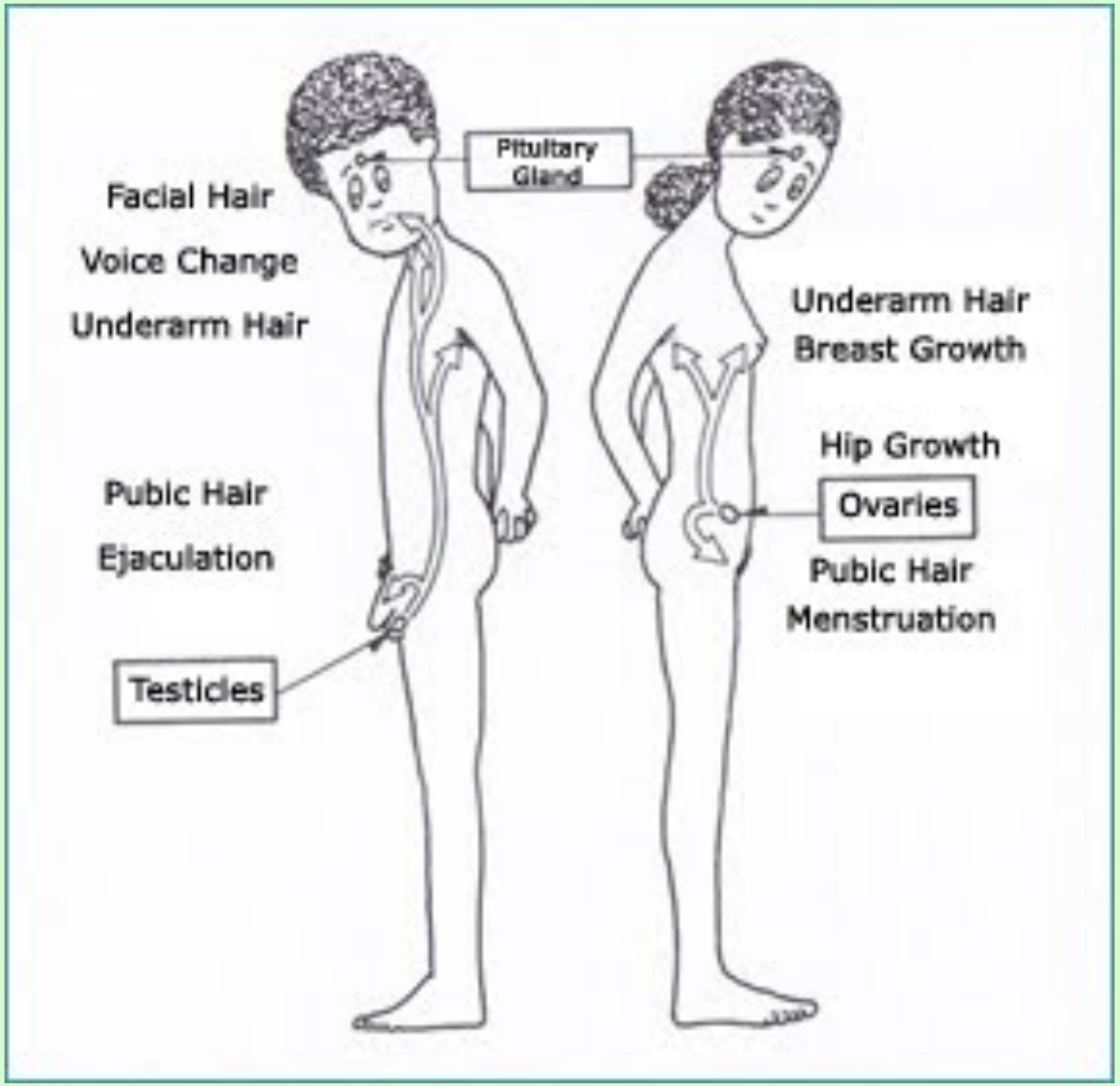
- Adolescence is the stage between childhood and adulthood. At this stage, the reproductive system becomes active.
- **Puberty** is characterized by changes to the body that prepare it for the ability to reproduce. This usually occurs between the ages of 10 and 14.
- The beginning of puberty is marked by an increase in hormone production.
- A **hormone** is a chemical produced by certain glands. The hormone is secreted into the blood and carried to the reproductive organs and stimulate them to begin working.

- Puberty begins when the pituitary gland, located at the base of the brain, secretes two hormones:
  - Follicle-stimulating hormone, **(FSH).**
  - Luteinizing hormone, **(LH).**

- In males:
  - FSH and LH stimulate the maturation of spermatozoa and stimulate the testicles to produce **testosterone**, (male sex hormone).
- In females:
  - FSH and LH stimulate the maturation of ova and the ovaries to produce **estrogen and progesterone**, (female sex hormones).



KEEP CALM AND SURVIVE PUBERTY



Hormone Action in Males and Females

Male

- Psychological changes.
- Facial, underarm, chest and pubic hair appear.
- Larynx enlarges, causing the voice to deepen.
- Genital organs mature.

Female

- Psychological changes.
- Underarm and pubic hair appear.
- Breasts develop.
- Pelvis widens.
- Menstrual cycle begins.
- Genital organs mature.

Primary and Secondary Characteristics

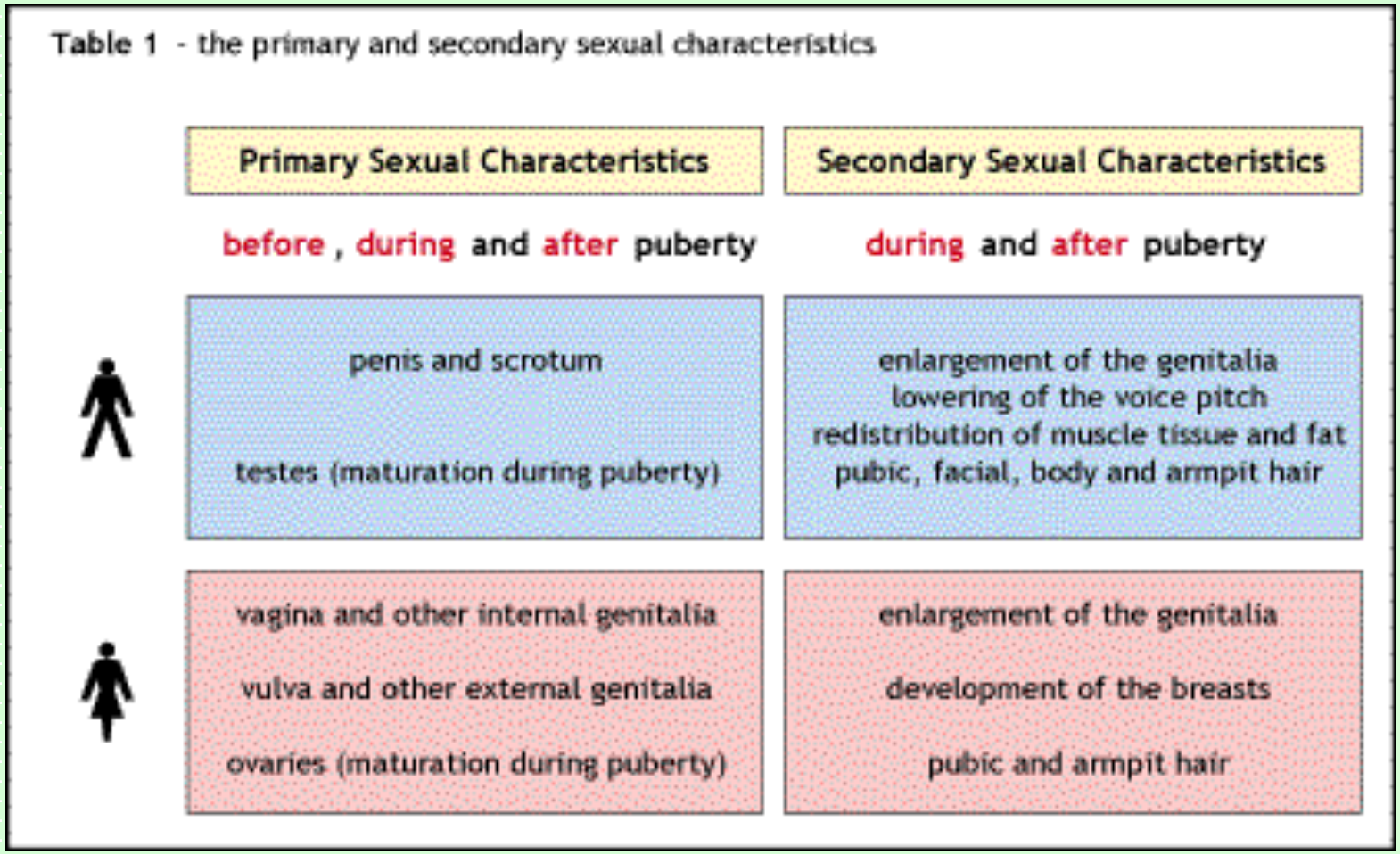
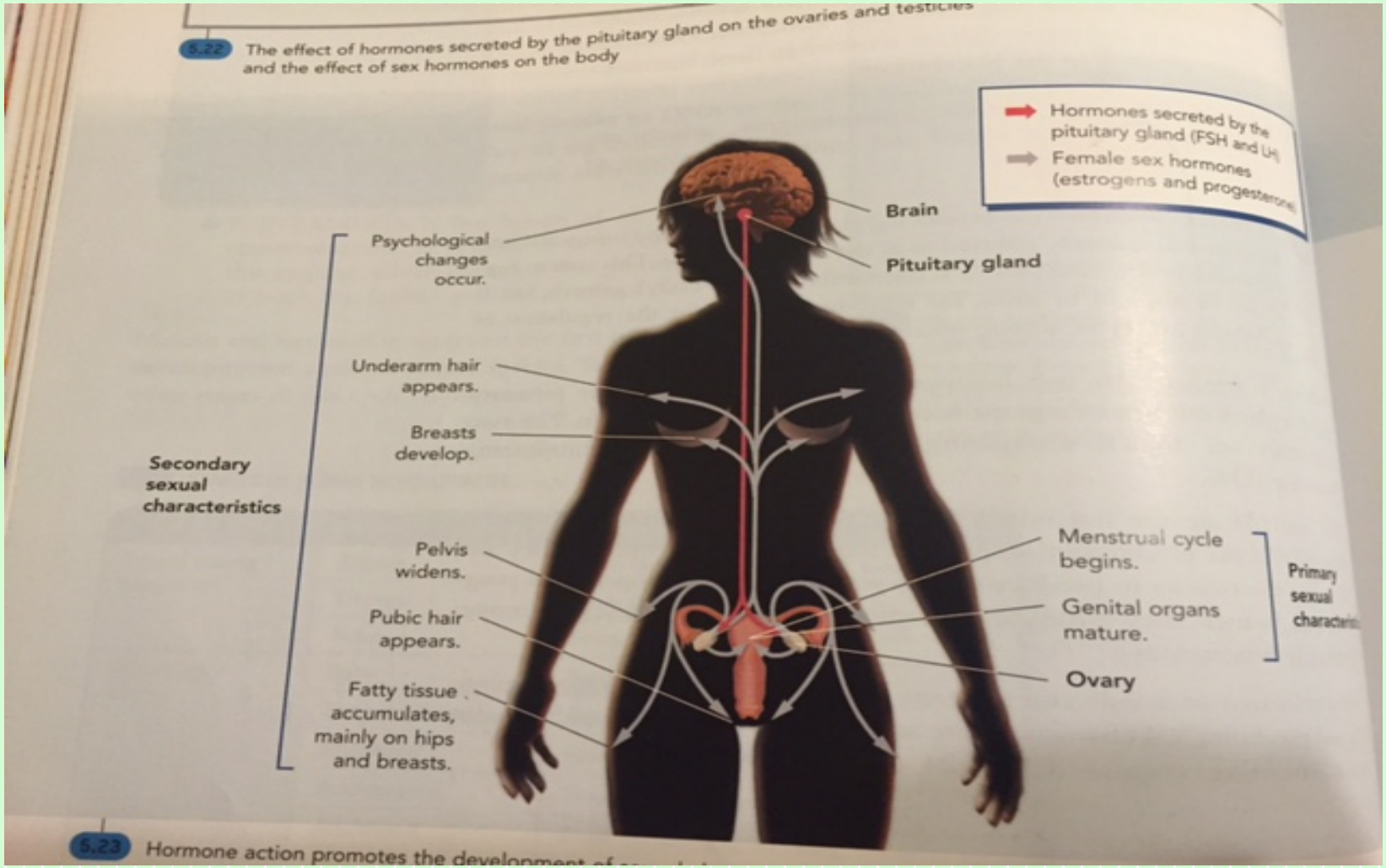


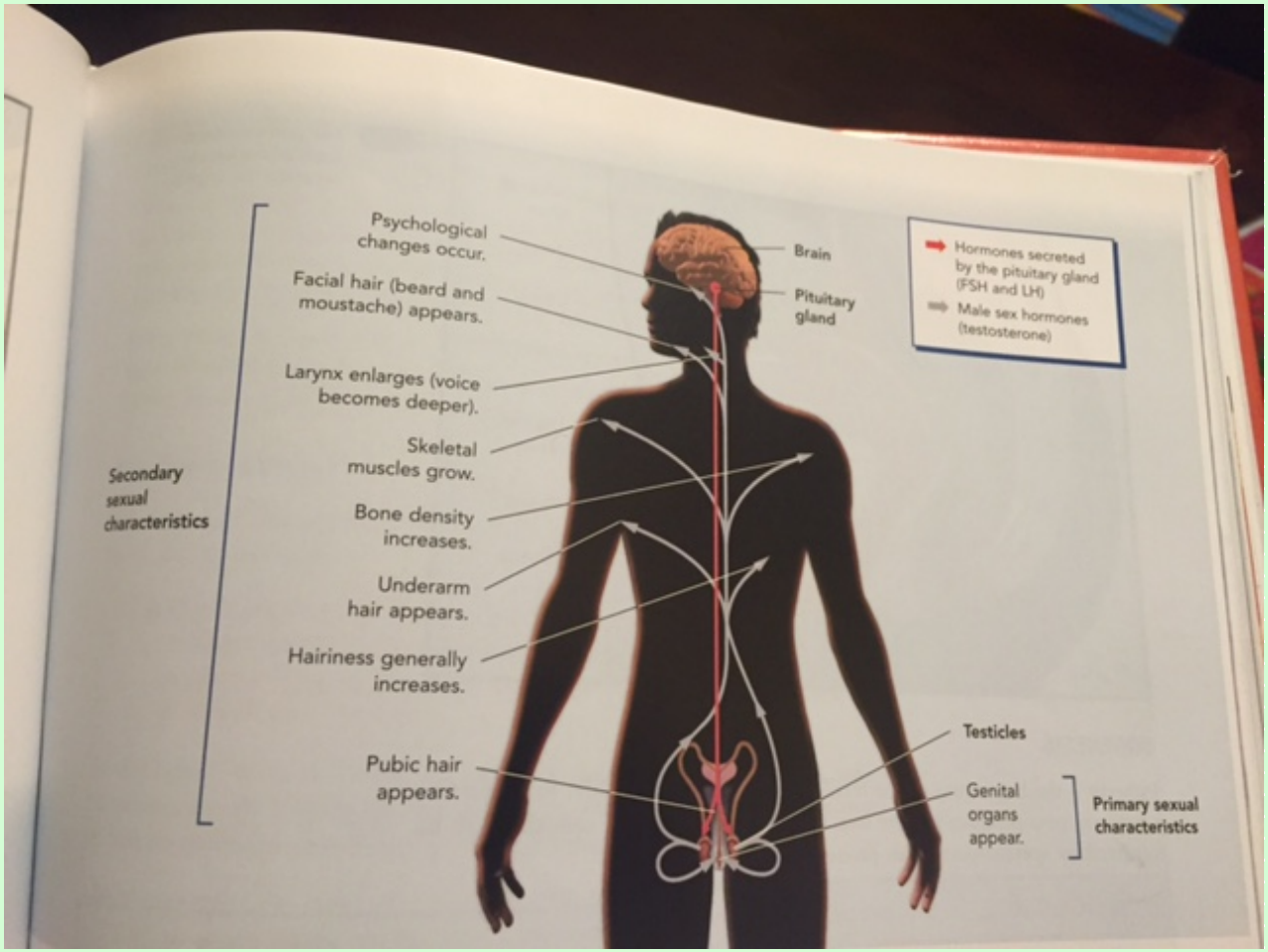
Table 1 - the primary and secondary sexual characteristics

	Primary Sexual Characteristics	Secondary Sexual Characteristics
	before , during and after puberty	during and after puberty
♂	penis and scrotum testes (maturation during puberty)	enlargement of the genitalia lowering of the voice pitch redistribution of muscle tissue and fat pubic, facial, body and armpit hair
♀	vagina and other internal genitalia vulva and other external genitalia ovaries (maturation during puberty)	enlargement of the genitalia development of the breasts pubic and armpit hair

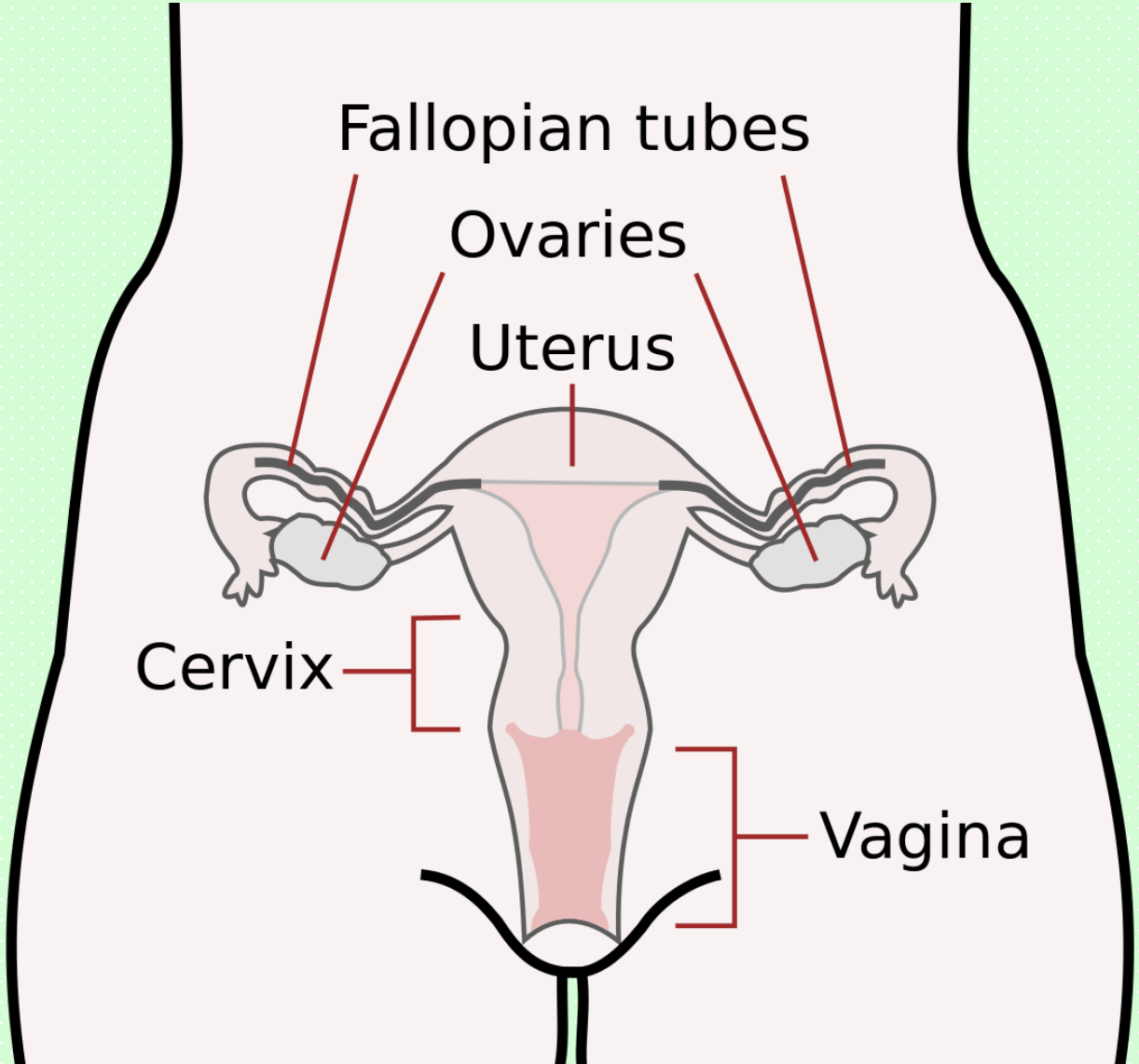
Female


5.22 The effect of hormones secreted by the pituitary gland on the ovaries and testicles and the effect of sex hormones on the body
Hormones secreted by the pituitary gland (FSH and LH)
Female sex hormones (estrogens and progesterone)
Brain
Pituitary gland
Psychological changes occur.
Underarm hair appears.
Breasts develop.
Secondary sexual characteristics
Pelvis widens.
Pubic hair appears.
Fatty tissue accumulates, mainly on hips and breasts.
Menstrual cycle begins.
Genital organs mature.
Primary sexual characteristics
Ovary
5.23 Hormone action promotes the development of

Male


Psychological changes occur.
Facial hair (beard and moustache) appears.
Larynx enlarges (voice becomes deeper).
Skeletal muscles grow.
Bone density increases.
Underarm hair appears.
Hairiness generally increases.
Pubic hair appears.
Secondary sexual characteristics
Brain
Pituitary gland
Hormones secreted by the pituitary gland (FSH and LH)
Male sex hormones (testosterone)
Testicles
Genital organs appear.
Primary sexual characteristics

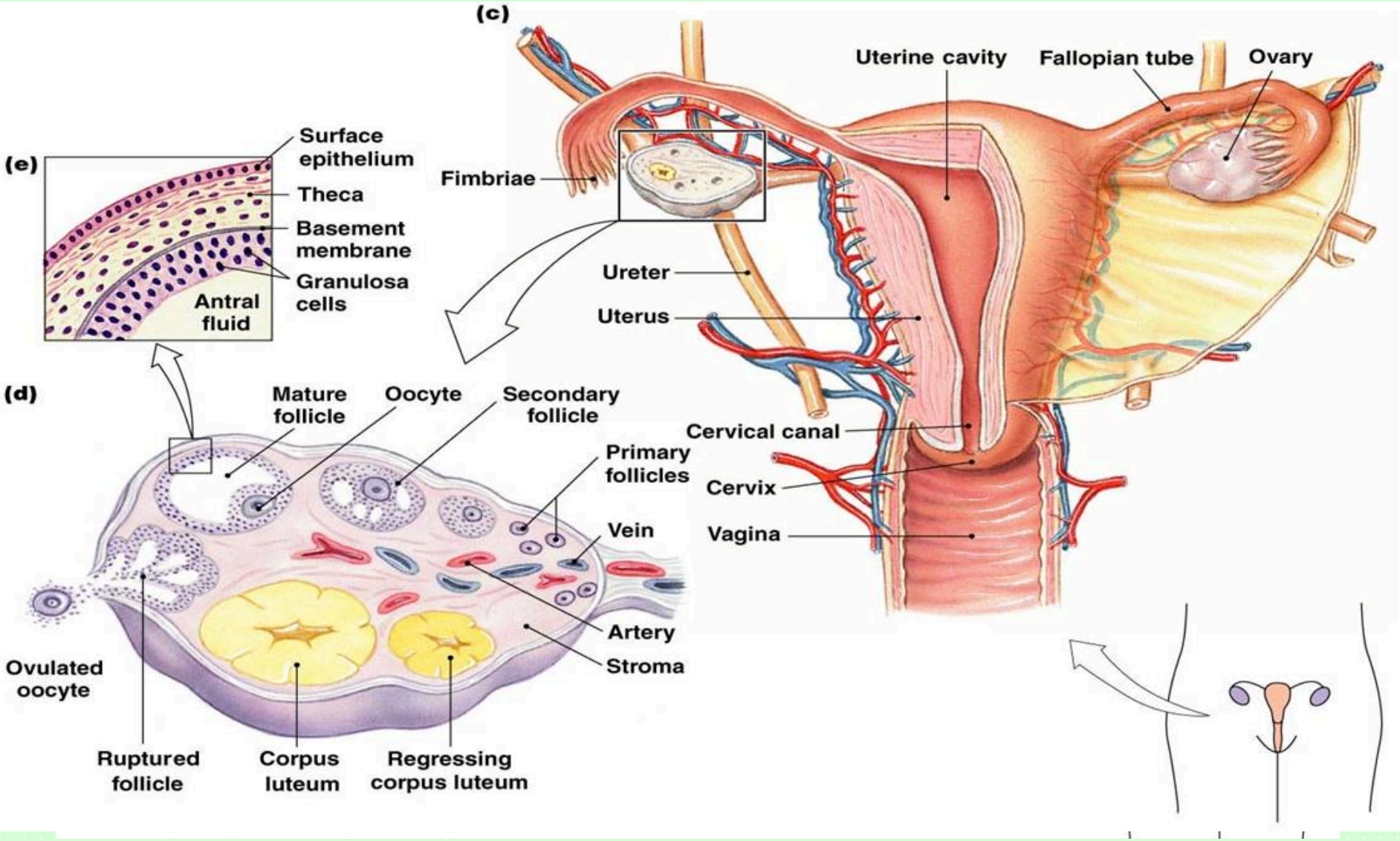
Female Reproductive System



The Female Reproductive System

- Puberty marks the beginning of the fertile phase of a woman's life. To be considered fertile, a woman must be able to produce mature ova, (haploid cells / gametes). The production of ova is called **oogenesis.**

- At puberty, around 700,000 cells are in the ovaries. These cells are called oocytes.
  - Each oocyte is enveloped in an **ovarian follicle**. When the follicle bursts, ovulation occurs.
  - It travels down the fallopian tube to the uterus
  - The ovum is capable of being fertilized. If it is, it will stay in the uterus and develop. If not, it will leave the body through the vagina.

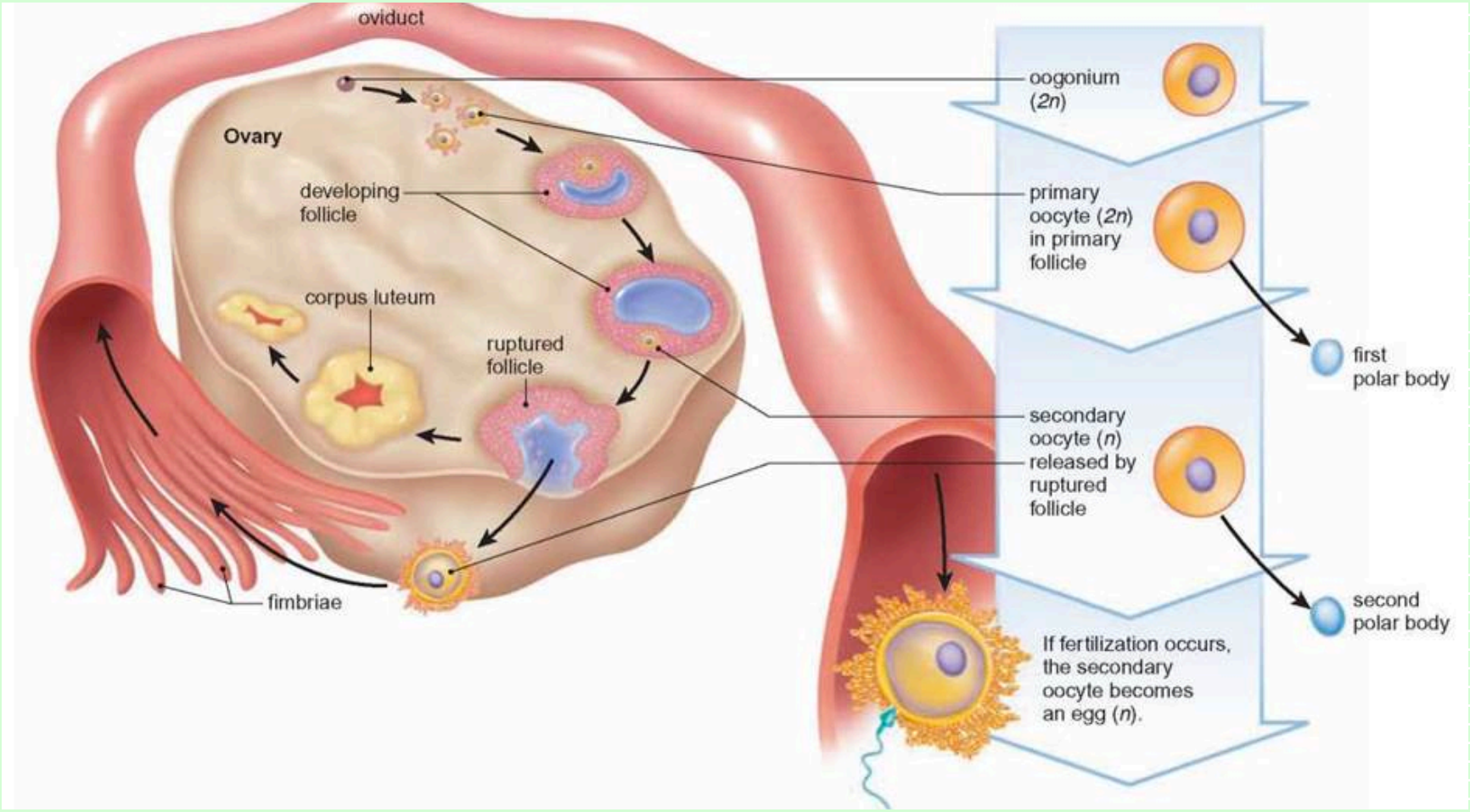

(c)
Uterine cavity
Fallopian tube
Ovary
Fimbriae
Ureter
Uterus
Cervical canal
Cervix
Vagina
(e)
Surface epithelium
Theca
Basement membrane
Granulosa cells
Antral fluid
(d)
Mature follicle
Oocyte
Secondary follicle
Primary follicles
Vein
Artery
Stroma
Ovulated oocyte
Ruptured follicle
Corpus luteum
Regressing corpus luteum

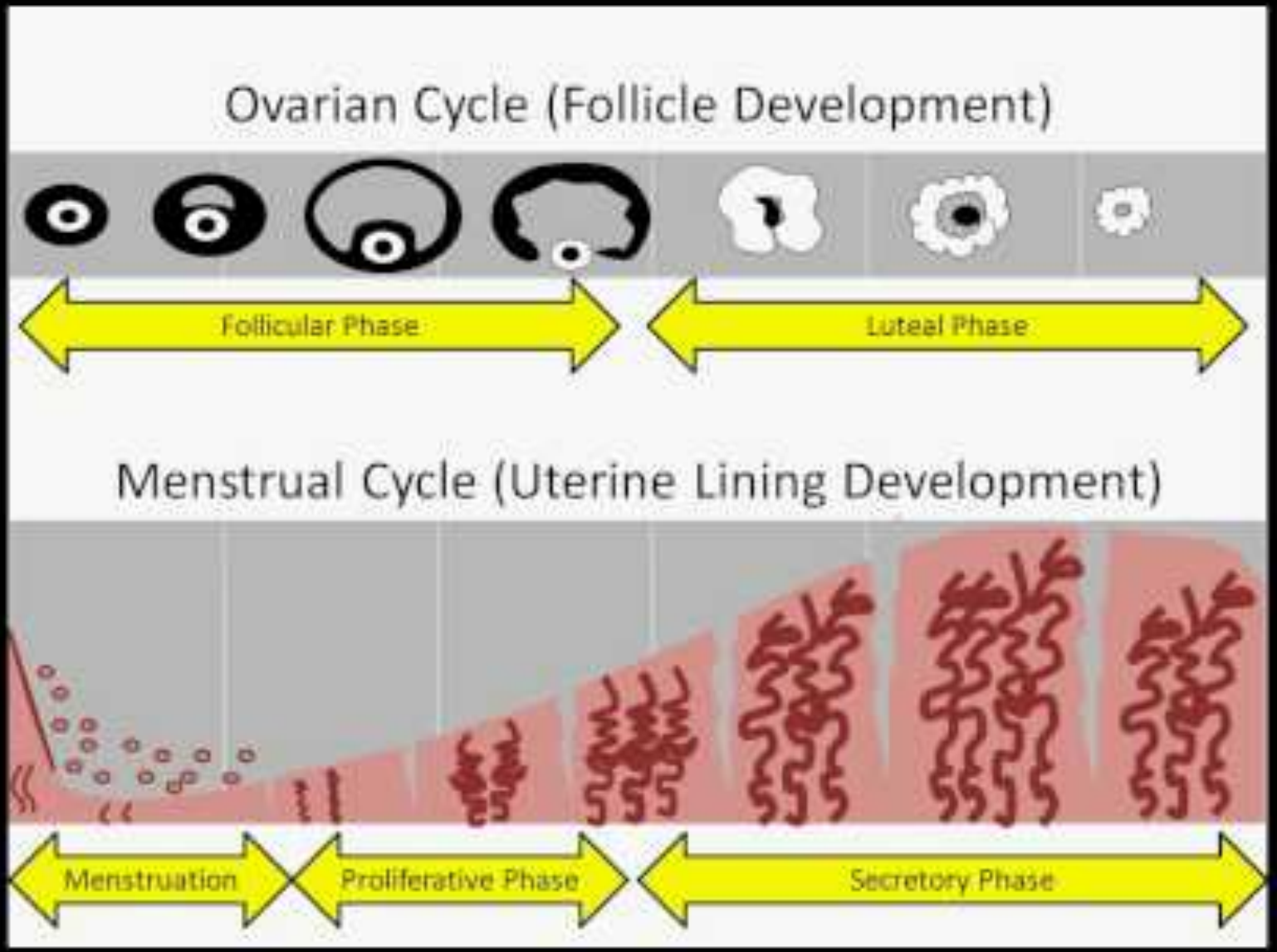
Ovarian Cycle – 28 Days

Hormone	Event
FSH is released from the pituitary gland.	Ovarian follicle, (surrounds the oocyte), matures.
Estrogen is secreted from the mature ovarian follicle.	Stimulates the pituitary gland to release LH.
Increase in LH and FSH.	The ovarian follicle ruptures, releasing the ovum and performing ovulation.
LH heals the ruptured ovarian follicle.	Creates **corpus luteum**, a temporary structure that will produce progesterone to prepare the body to receive a fertilized ovum.
Progesterone produced by the corpus luteum.	Stimulates the thickening of the uterine wall, (**endometrium**).

If the ovum does not become fertilized, the corpus luteum disintegrates and stops producing progesterone. The uterine wall will detach and the menstruation begins. If it is fertilized, the corpus luteum continues producing progesterone until the placenta forms.

Ovarian Cycle




Ovarian Cycle (Follicle Development)
Follicular Phase
Luteal Phase
Menstrual Cycle (Uterine Lining Development)
Menstruation
Proliferative Phase
Secretory Phase

Menstrual Cycle – 28 Days

- The ovarian cycle and hormone action over the course of 28 days also stimulates the menstrual cycle.

- Where the ovarian cycle occurs mainly in the ovaries and fallopian tubes, the menstrual cycle occurs in the uterus.

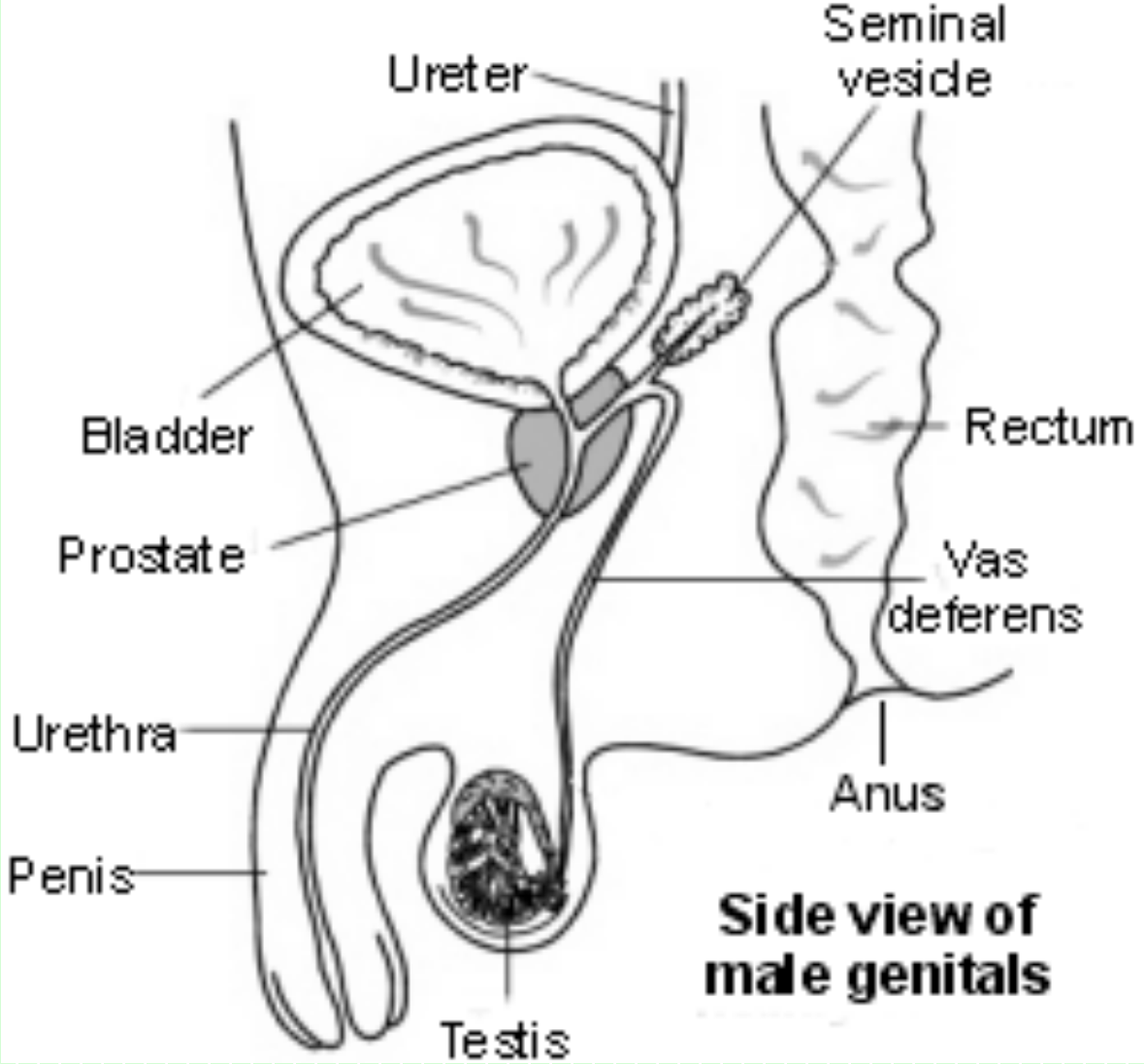
- If the ovum has been fertilized, then no menstruation occurs. The zygote will implant itself into the endometrium.

Phase	Event	Hormones
Menstrual Day 1 – 5	Bleeding occurs, due to the shedding of the endometrium and the unfertilized ovum.	Progesterone decreases due to the corpus luteum disintegrating.
Proliferation Day 6 – 14	Endometrium thickens and the body prepares for possible fertilization.	Estrogen produced from a new ovarian follicle forming.
Secretory Day 15 – 28	Endometrium continues to thicken.	Progesterone by the corpus luteum.

Pregnancy is most likely to occur from three days before ovulation to one day after, giving four days in which a woman is most fertile. However, this is not exact, as spermatozoa may live in the female body for 24-72 hours.

The menstrual cycle may vary, but what rarely varies is the 14 days from ovulation to menstruation.

Male Reproductive System



The Male Reproductive System

- Hormones play an important role in the production of spermatozoa.
- When a boy enters puberty, the pituitary gland produces FSH, which stimulates **spermatogenesis.**
- Spermatozoa are produced in the **testicles**, and are stored in the **epididymis**, (another sac within the scrotum).
- Some will be pushed into the **vas deferens** where they are kept until ejaculated and expelled through the urethra.

Erection and Ejaculation

- The urethra is the canal through which spermatozoa are expelled. Since urine kills spermatozoa, they never are expelled at the same time.

- An **erection** occurs during male sexual arousal. The penis fills with blood, causing it to increase in volume and rigidity. At this time, muscles between the bladder and the urethra contract, disallowing urine from coming into contact with spermatozoa.

Erection and Ejaculation

- When the penis is erect, the spermatozoa are pushed from the **vas deferens** to the urethra where it joins with a whitish fluid produced by the seminal vesicles and prostate. This creates **semen**.

- When the semen builds up, it puts pressure on the prostate, causing **ejaculation**.

- During ejaculation, muscles surrounding the urethra contract, forcing the semen out.
- On average, and ejaculation contains 3.5 mL of semen and 350 million spermatozoa.