

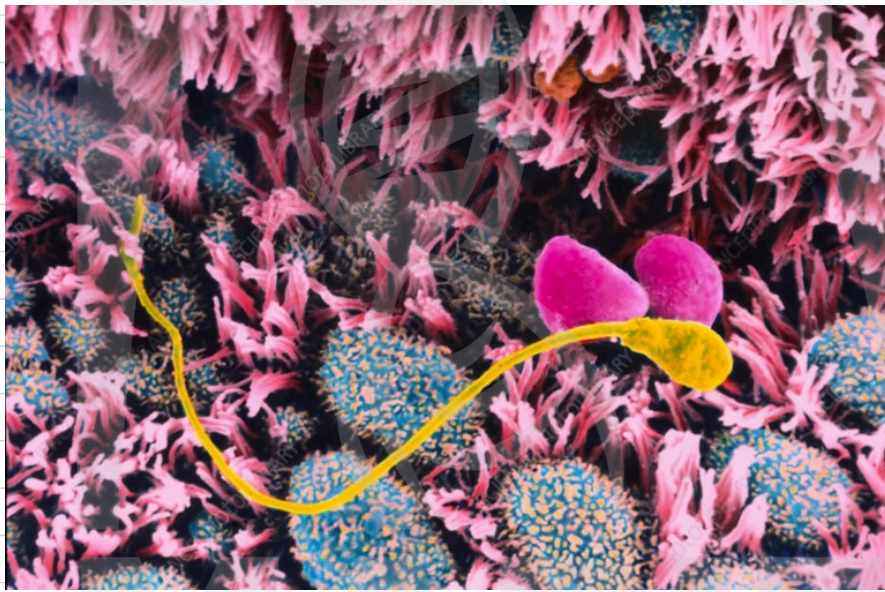
Human Reproduction

Learning outcomes

- ☒ draw and label a human male and female reproductive system
- ☒ understand the functions of the structures of the human male and female reproductive system
- ☒ understand the development of secondary sex characteristics during puberty for males and females
- ☒ understand what occurs during the menstrual cycle
- ☒ understand the stages of human reproduction from intercourse to implantation
- ☒ understand how the placenta aids in fetal development
- ☒ understand what occurs during childbirth

Key terms

- testosterone
- estrogen
- progesterone
- puberty
- menstrual cycle
- ovulation
- menstruation
- semen
- ejaculation
- zygote
- gestation
- placenta
- umbilical cord

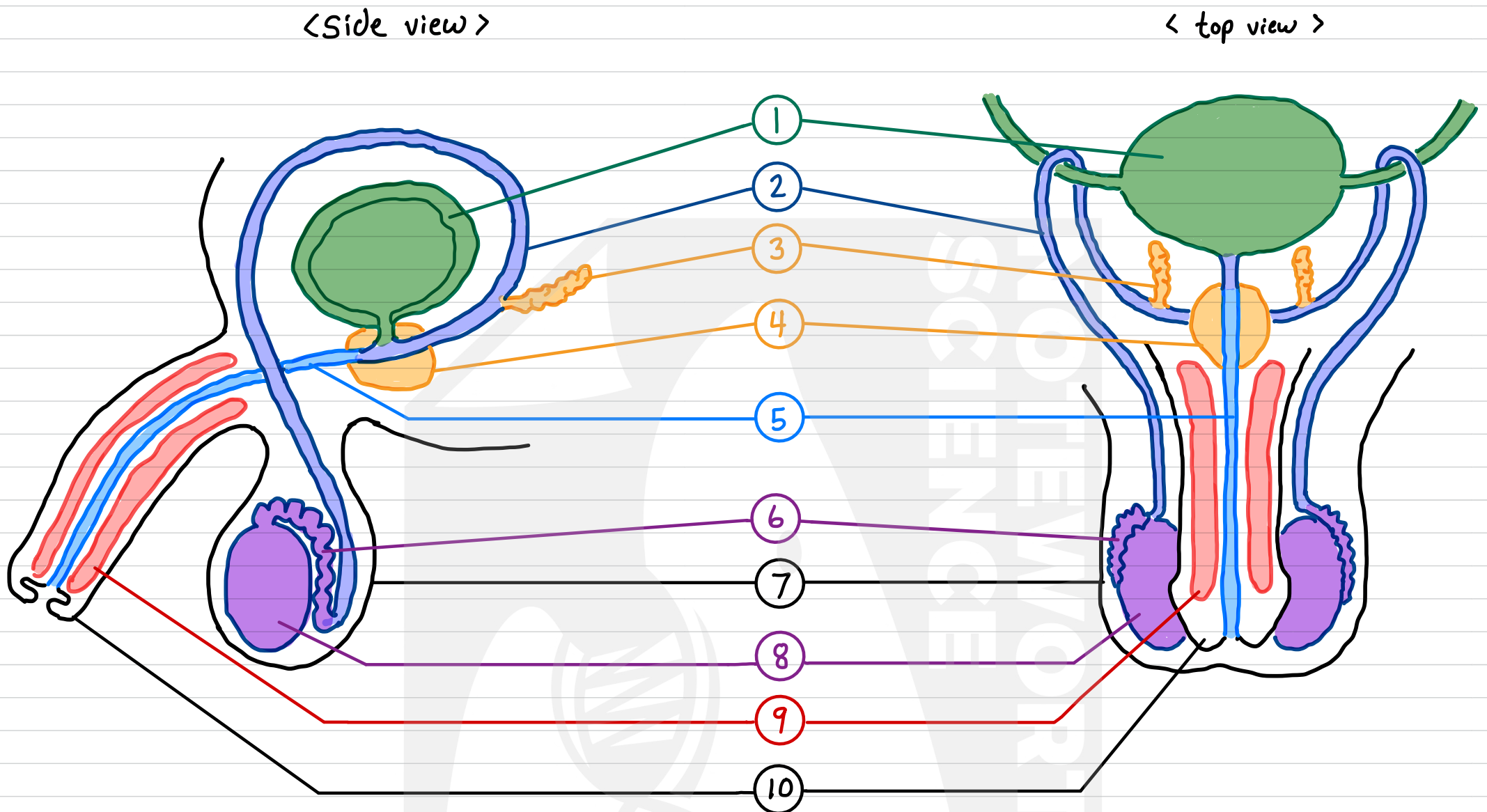


Human Reproductive Systems

Primary sex characteristics of males:

- when an embryo becomes a male, it will develop primary male sex characteristics, i.e. reproductive organs

Male reproductive system



Structures & Functions

- ① Bladder - storage and expulsion of urine
- ② Vas deferens / sperm duct - transports sperm from epididymus to sperm during ejaculation
- ③ Seminal vesicle - adds nutrients, like sugars, to semen (for respiration) and mucus (for protection)
- ④ Prostate gland - adds alkaline fluid to semen (to neutralize acidic vagina)
- ⑤ Urethra - transports semen (during ejaculation) and urine (during urination)
- ⑥ Epididymis - site where sperm mature and are stored, awaiting ejaculation
- ⑦ Scrotum - protects and holds testes outside the body (to maintain lower temperature)
- ⑧ Testis - produces sperm and **testosterone**: hormone responsible for male characteristics. Levels much higher in males
- ⑨ Erectile tissue - fills with blood and becomes stiff during sexual arousal
- ⑩ Penis - external structure which penetrates vagina during intercourse in order to deliver sperm

Human Reproductive Systems

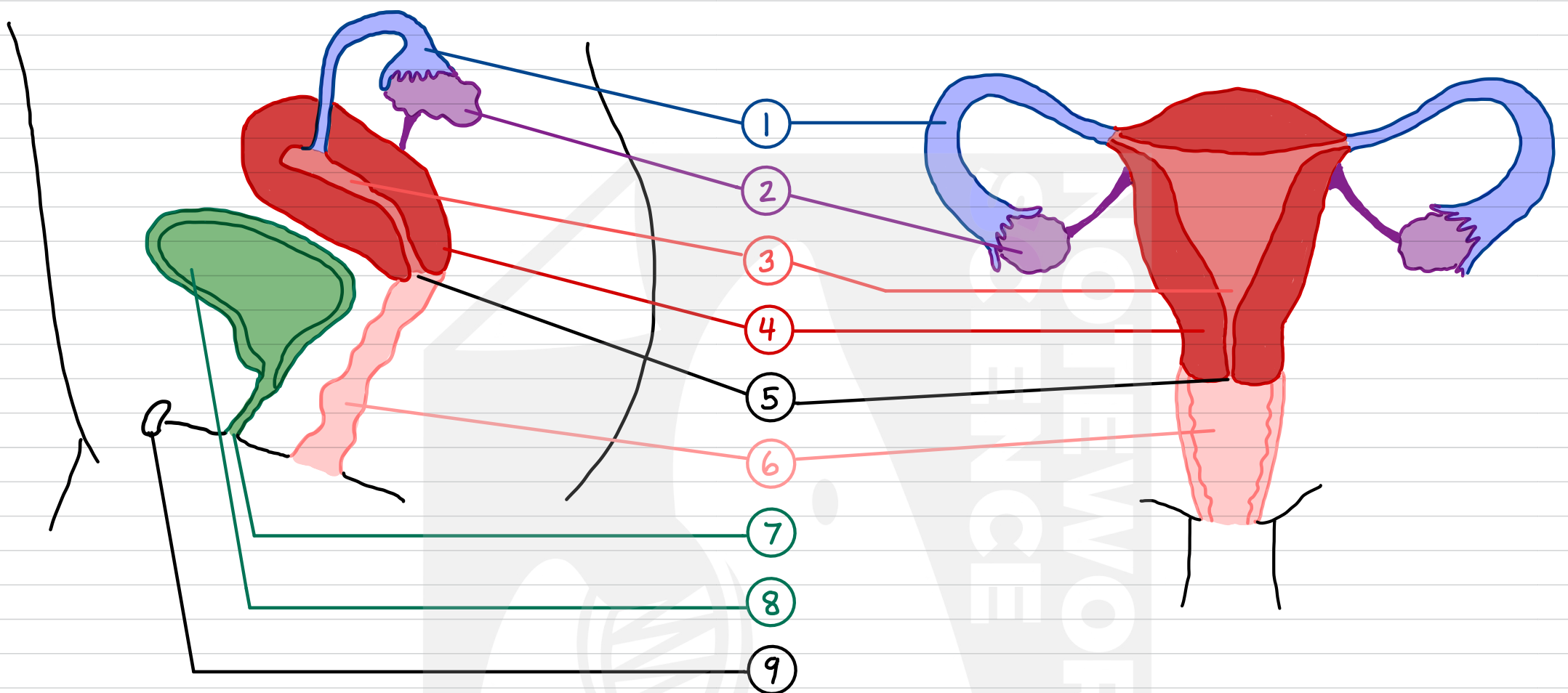
Primary sex characteristics of females:

- when an embryo becomes a female, it will develop primary female sex characteristics, i.e. reproductive organs

Female reproductive system

< Side view >

< top view >



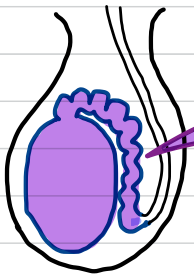
Structures & Functions

- ① Fallopian tube / oviduct - connects ovary to uterus. Site of fertilization
 - ② Ovary - site of ova maturation. Produces **estrogen** and **progesterone**
 - ③ Uterus / womb - nourish developing embryo/fetus
 - ④ Uterine lining / endometrium - site of embryo implantation and placenta (during pregnancy)
 - ⑤ Cervix - opening to the uterus (closes during pregnancy, opens during childbirth)
 - ⑥ Vagina - accepts penis (and sperm) during intercourse. Passageway for childbirth)
 - ⑦ Urethra - transports urine during urination
 - ⑧ Bladder - storage and expulsion of urine
 - ⑨ Clitoris - responsible for sexual pleasure
- hormone responsible for female characteristics

Secondary Sex Characteristics

Puberty: period when boys and girls become sexually mature and develop secondary sex characteristics

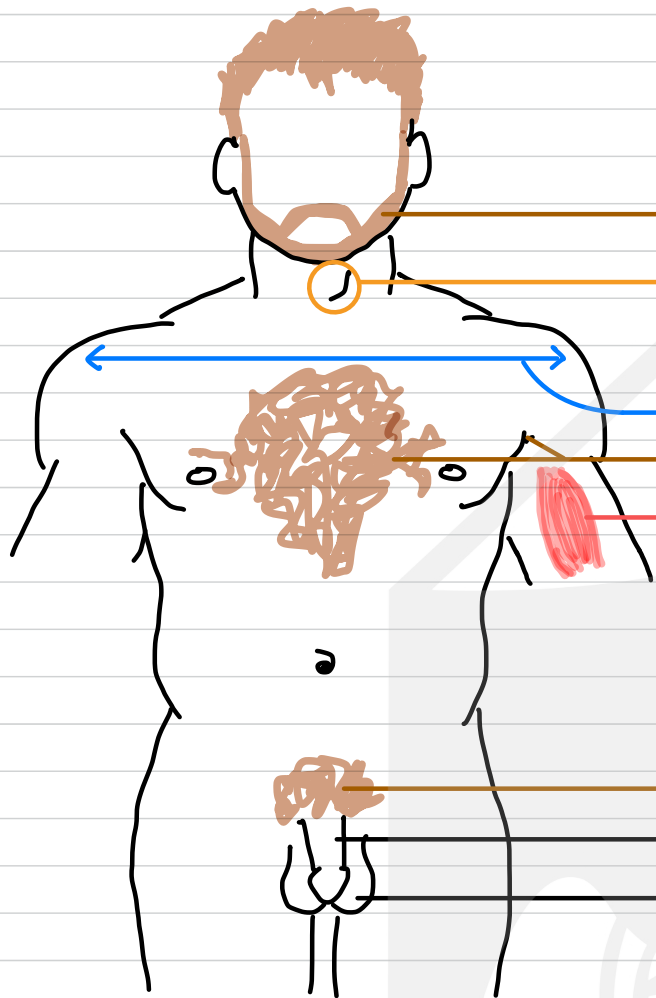
capable of reproducing



testes produce testosterone

which cause

Male secondary sex characteristics



facial hair growth

vocal chords lengthen - voice gets much deeper

shoulders and chest broaden

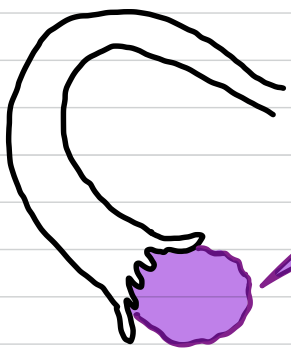
body hair growth

muscle growth

pubic hair growth

penis growth

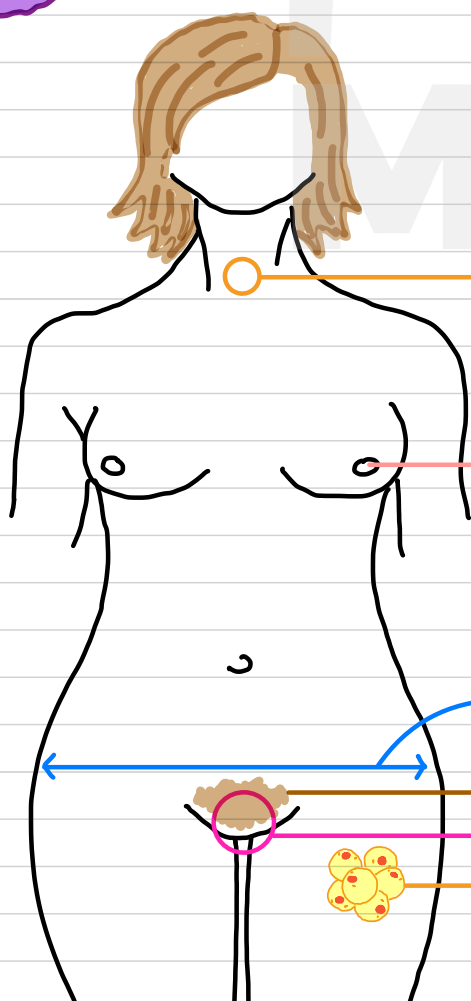
testes growth and production of sperm



ovaries produce estrogen and progesterone

which cause

Female secondary sex characteristics



vocal chords lengthen - voice gets a little deeper

enlargement of breasts

widening of hips

pubic hair growth

external genitalia development. start of ovulation and menstrual cycle

increased body fat (such as thighs and hips)

Menstrual Cycle

The **menstrual cycle** is a ~28 day monthly cycle where a woman's body prepares for potential pregnancy.

Starting in puberty, every month:

an ovum (ova) will begin to mature in the ovary
the ovaries will release an ovum (ova) - **ovulation**
and the uterus lining will thicken in preparation for an embryo

if fertilization occurs:

- the fertilized egg will implant in prepared uterus and begin to grow and develop

x menstrual cycle stops
✓ pregnancy has started

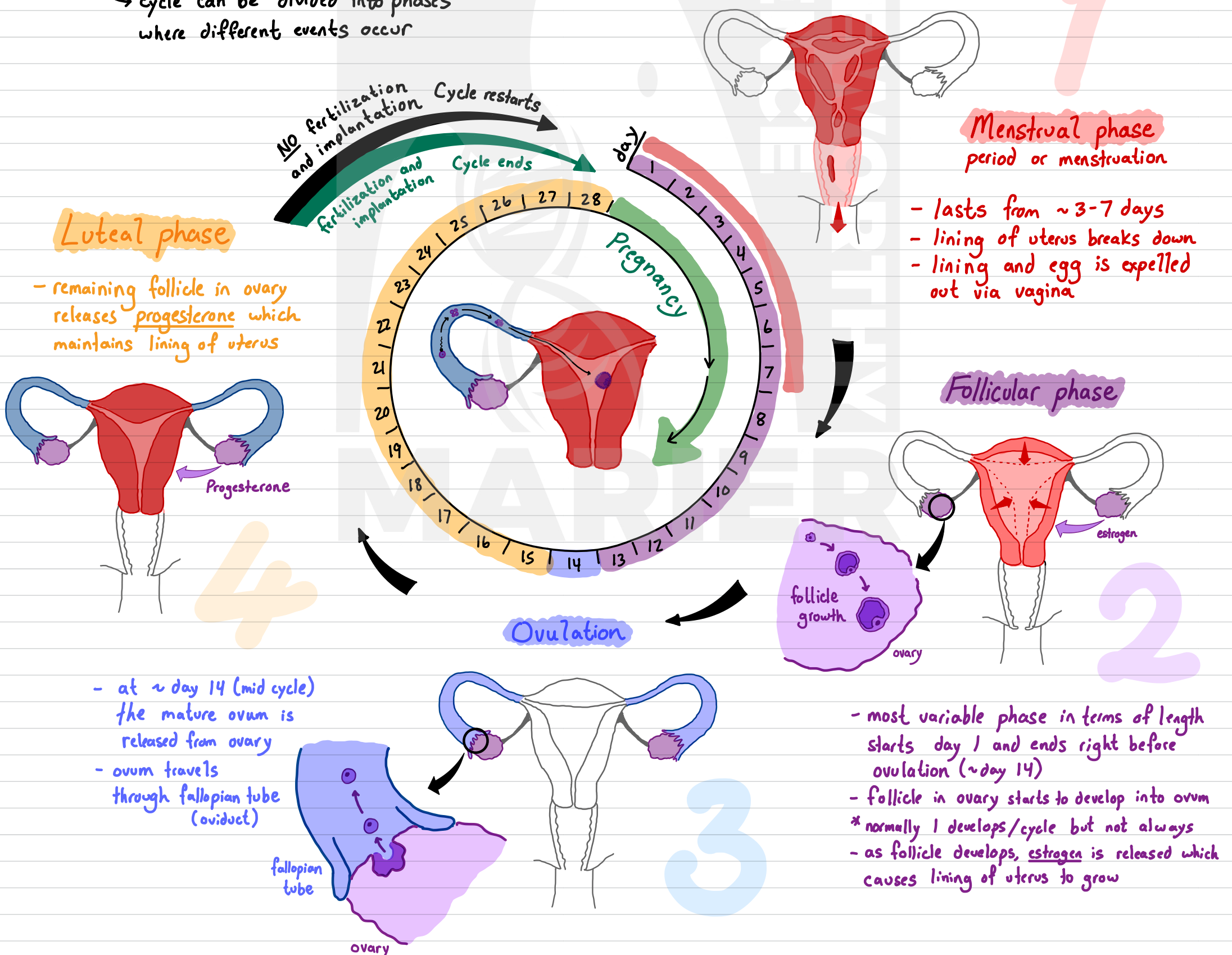
if fertilization does not occur:

- the lining and unfertilized egg is shed out through the vagina - **menstruation**

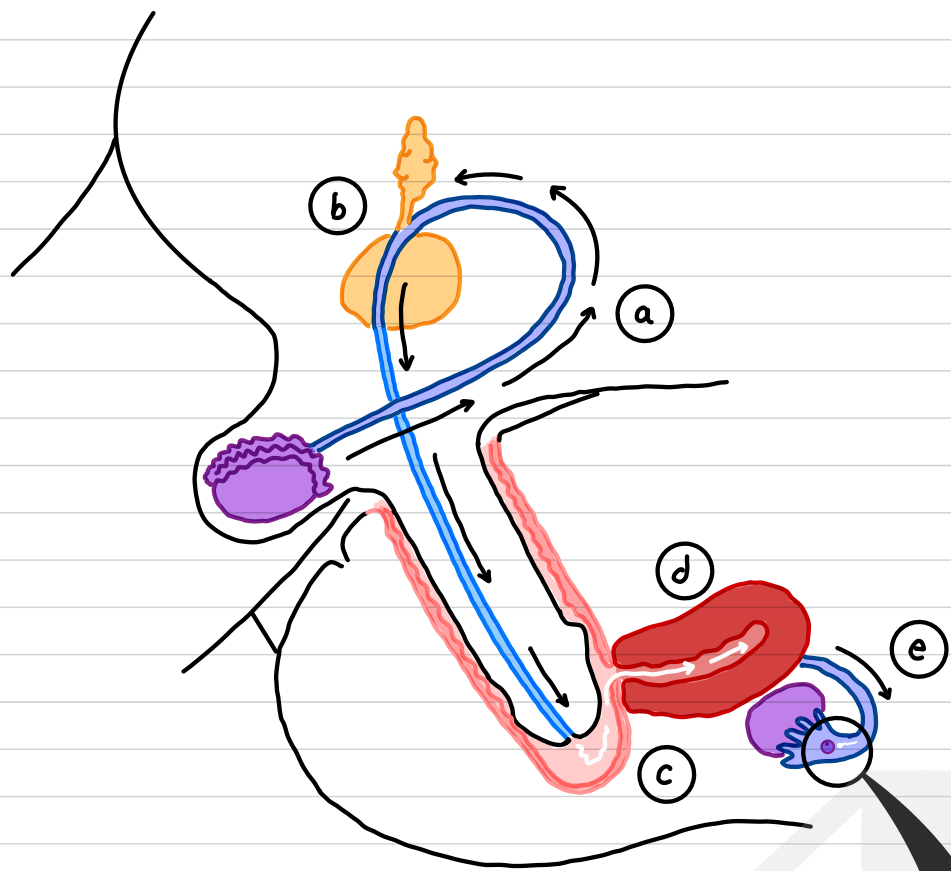
✓ menstrual cycle restarts
x pregnancy did not occur

Menstrual cycle

→ cycle can be divided into phases where different events occur

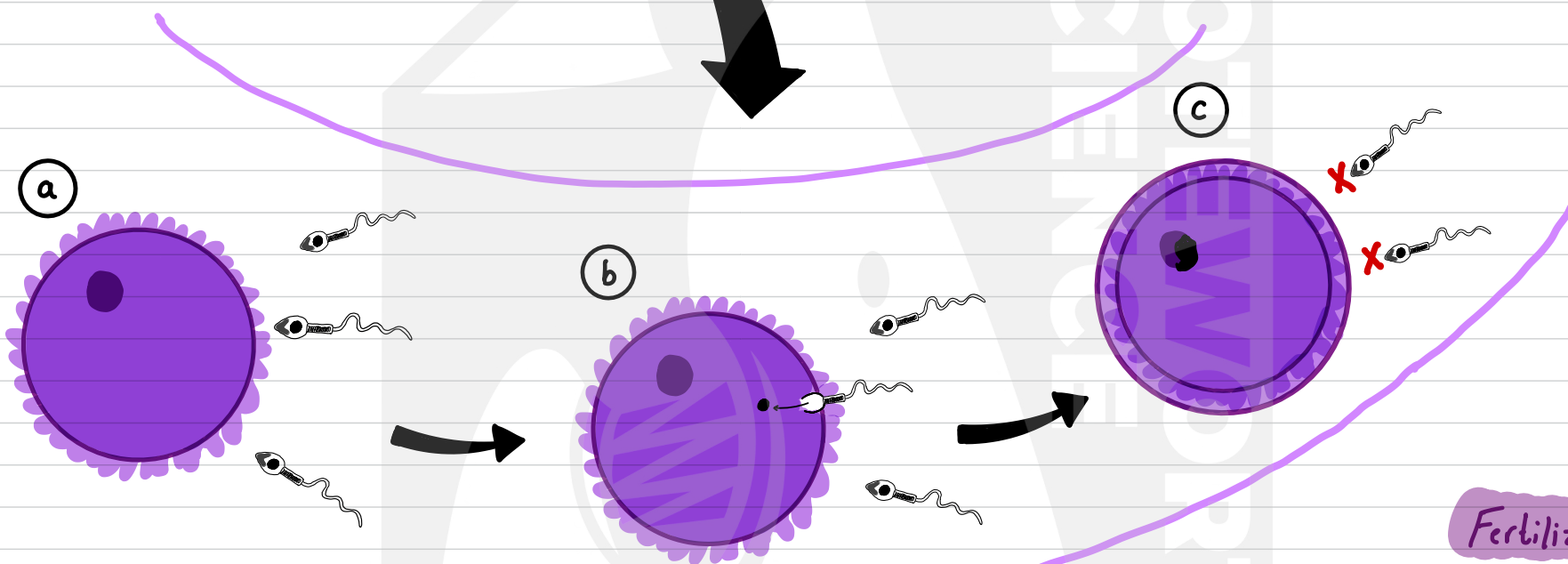


Human Sexual Reproduction



Intercourse

- (a) sperm released from epididymis and travels through vas deferens
- (b) prostate and seminal vesicle add fluid to sperm - now called **semen**
- (c) semen released from urethra of penis into vagina
→ **ejaculation**
- (d) sperm travels through cervix into uterus
- (e) sperm travel through fallopian tube

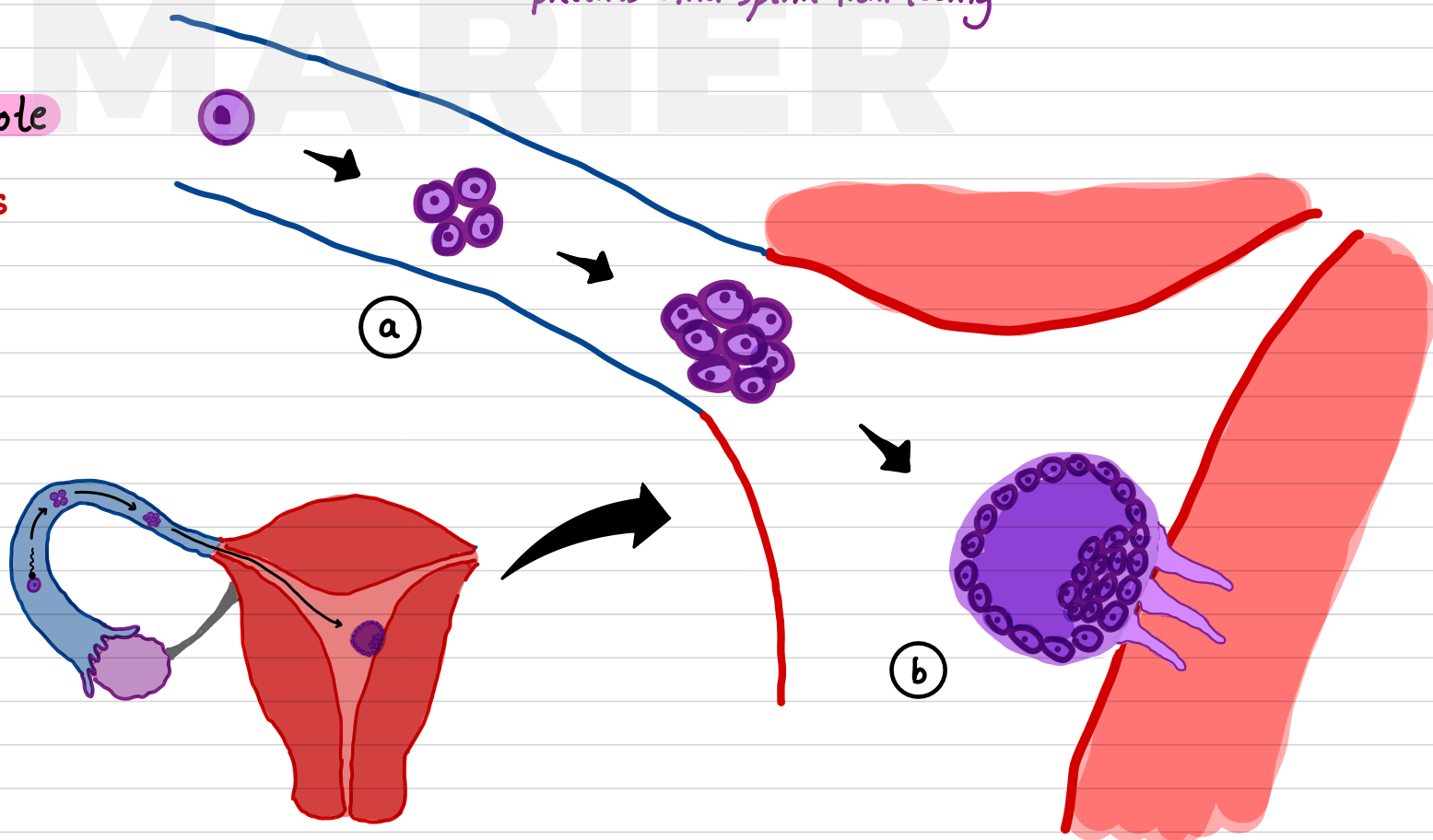


Fertilization

- (a) sperm arrive at ovum in fallopian tube
- (b) the enzymes in the tip of the sperm break down outer layer of ovum. As sperm fuses, its nucleus enters ovum.
- (c) nuclei of ovum and egg fuse. ovum forms outer layer which prevents other sperm from fusing

Implantation

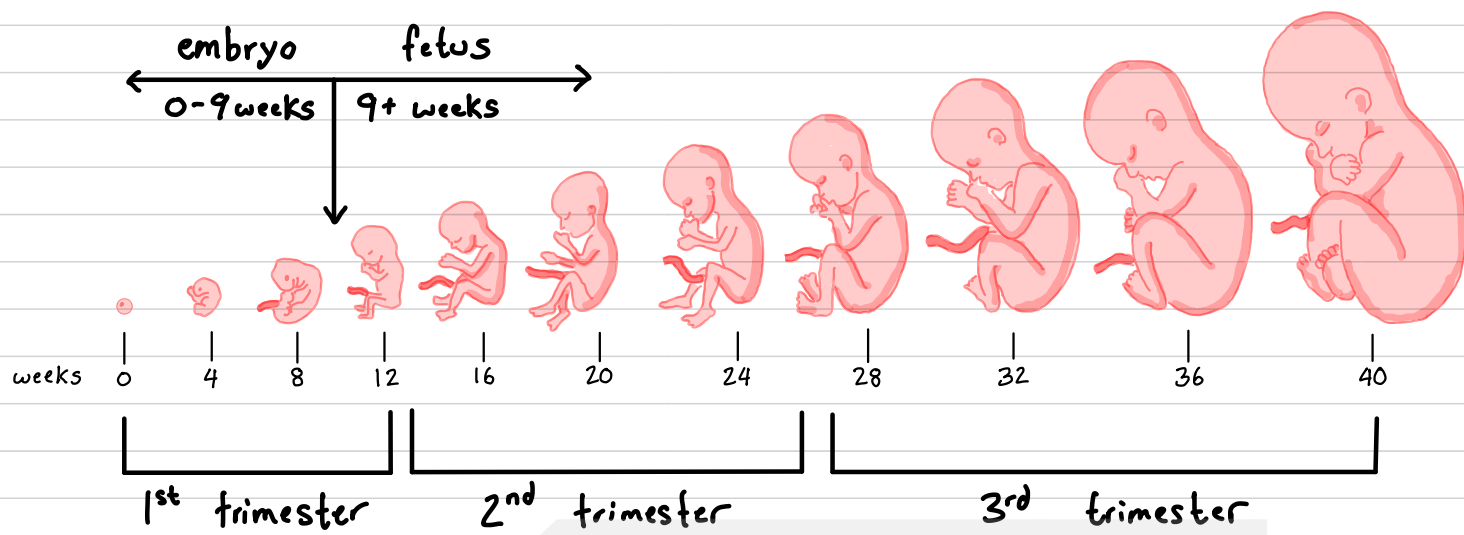
- (a) the fertilized egg: **zygote** starts dividing and is moved toward the uterus
- (b) the mass of cells then implants in the wall of the uterus
↓
will form embryo and placenta



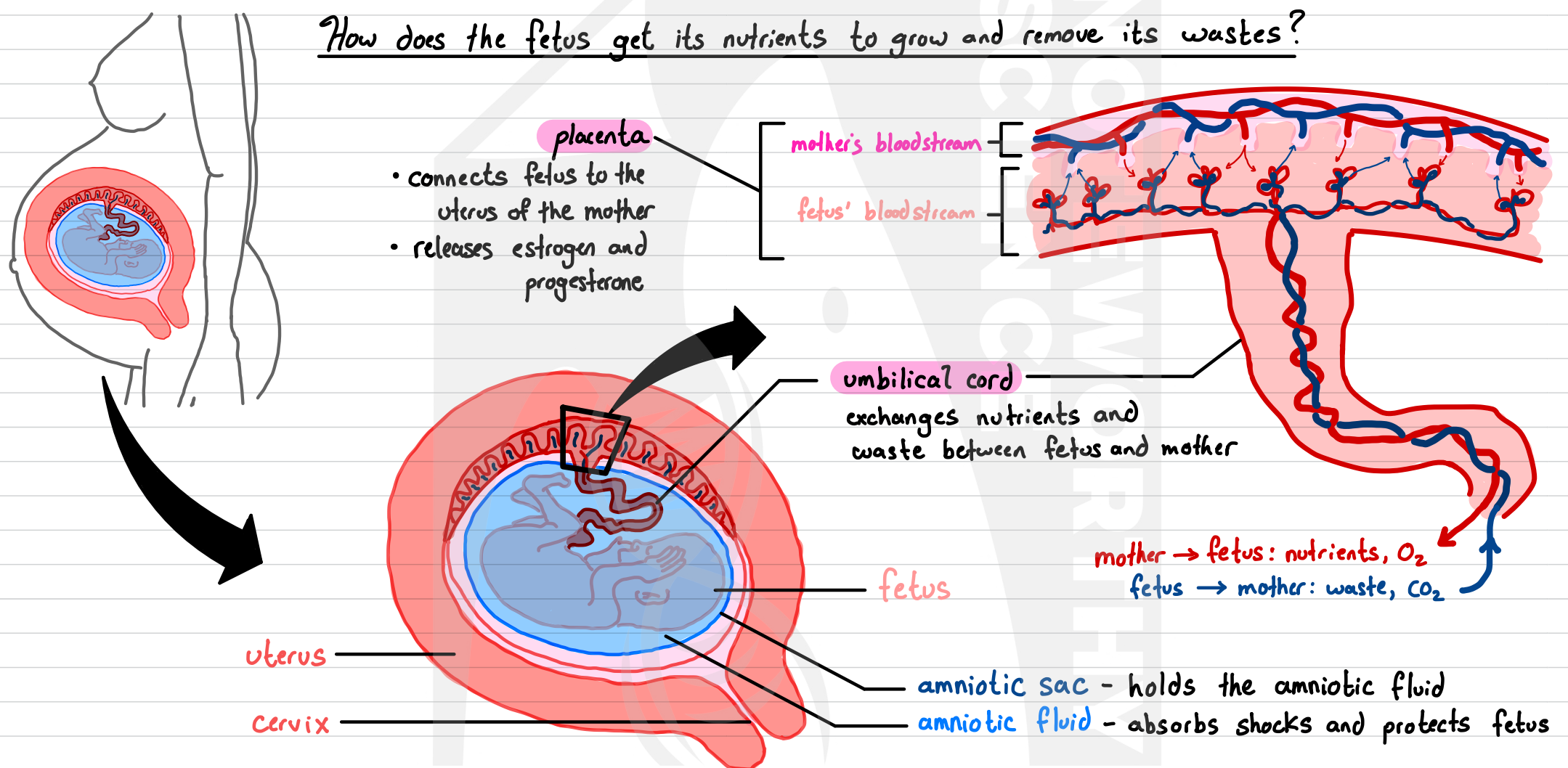
Gestation and Childbirth

Gestation: the time between fertilization and birth when an offspring is growing and developing within a mother

↳ in humans, this time commonly ranges from 37-42 weeks, an average of ~40 weeks

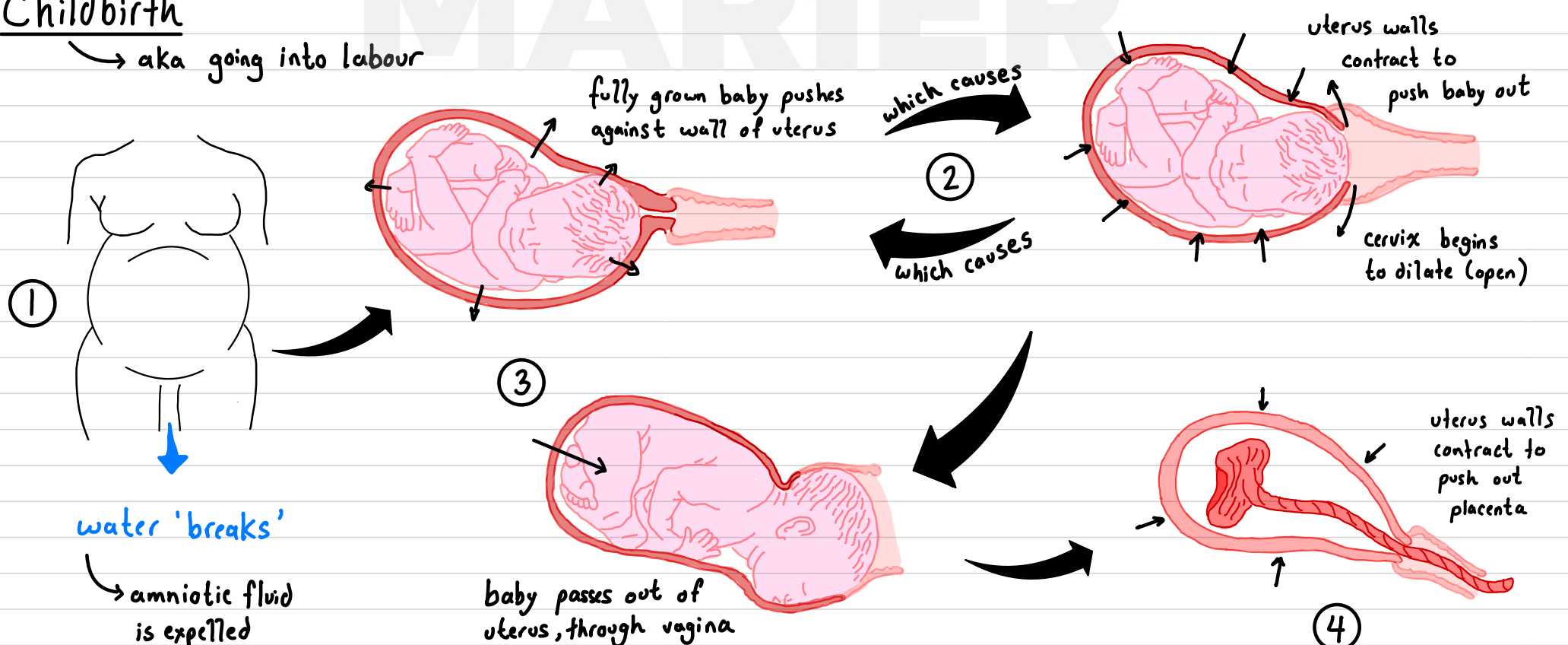


How does the fetus get its nutrients to grow and remove its wastes?



Childbirth

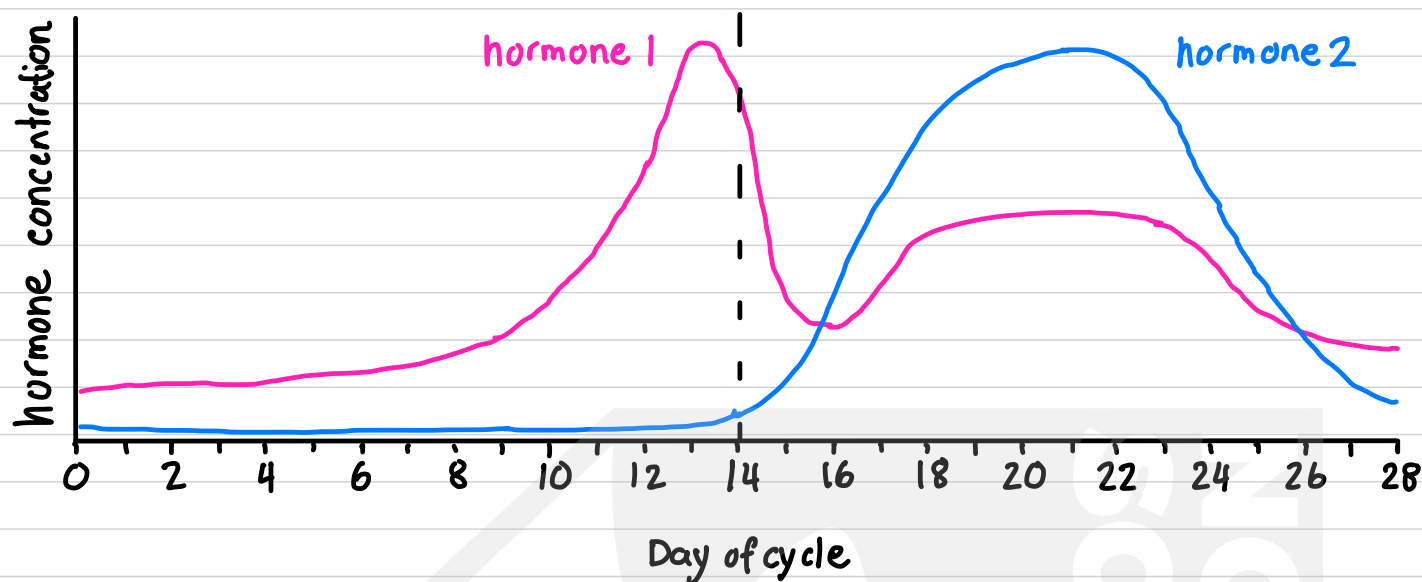
↳ aka going into labour



Assessment Tasks

Answer the following questions:

- ① The graph shows the change in concentration of 2 hormones during the menstrual cycle



- Name the hormones on the graph
 - What is triggered by the fall in concentration of hormone 2 towards the end of the cycle?
- ② Contraceptives are devices or drugs that prevent pregnancy.
- One of the most common and simple are condoms. These are considered a physical barrier. Explain how these prevent fertilization
 - Hormonal contraceptives, or the 'pill', work by preventing ovulation. Explain how these prevent fertilization
 - Sexually transmitted infections (STIs) can be transmitted through sexual intercourse. Which type of contraceptive can prevent these and which cannot? Explain.
- ③ If multiple sperm fuse with the egg, pregnancy will not occur. Explain why.
- ④ Twins are when multiple children are born during the same pregnancy. There are two types: identical twins and fraternal twins. Genetic analysis of the twins reveal that identical twins are clones whereas fraternal twins are not and are just as similar as any other sibling. Explain how each of these cases could occur.
- ⑤ During pregnancy, if the mother consumes alcohol, smokes or takes drugs it can affect the fetus. Explain how.
- ⑥ In the past, it was common for some young boys to be castrated (removal of testes) before puberty so they could sing high notes in theatre. Explain how this practice works and what other impacts this would have on the boys.