LIFE SCIENCES GRADE 12 CAPS

STRUCTURED, CLEAR, PRACTICAL - HELPING TEACHERS UNLOCK THE POWER OF NCS

KNOWLEDGE AREA:
Life Processes in Plants and Animals

TOPIC 2.1: Reproduction in Vertebrates

Human Reproduction

Sangari SouthAfrica
THINK. DO. LEARN.

GAUTENG
PROVINCIAL GOVERNMENT

SUMMARY OF PRESENTATION

- Introduction
- Structure of Male Reproductive System
- Structure of Female Reproductive System
- Main Changes that occur during Puberty
- Gametogenesis
- Menstrual Cycle
- Fertilization and Embryonic Development
- Implantation and Development
- Gestation
- Role of Placenta

INTRODUCTION:

- There are **2 types of reproduction**.
- These are…

1. Sexual and
2. Asexual reproduction

- We are studying reproduction in humans.
- Therefore we need to know what is sexual reproduction.
- **Sexual reproduction** is reproduction that occurs **with the use of gametes**.

INTRODUCTION:

- In **humans fertilization** occurs **during sexual reproduction**.
- This means a **haploid sperm fuses with a haploid egg** to form a **diploid zygote**.
- The **zygote** has **46 chromosomes or 23 pairs of chromosomes** therefore it is called **diploid**.

So how many chromosomes does the egg and sperm have?

SOLUTION:

- The sperm has 23 chromosomes
- The egg has 23 chromosomes

INTRODUCTION:

- The **zygote** then **divides by mitosis** to produce a **large number of identical cells**.
- **All the cells** have the **same number of chromosomes and identical DNA**.
- Some of these **cells become differentiated**.
- This means that the **cells undergo physical and chemical changes to perform specialized function**.
- Therefore these **cells are adapted for their functions**.
- This is how the body parts are formed.

INTRODUCTION:

- Therefore the **zygote eventually develops into a fully formed adult**.
- **Sexual maturity** occur **between 11-15**.
- It is known as **puberty**.
- During **puberty meiosis** occurs in the **male and female reproductive organs to produce the gametes**.
- Since the **gametes are produced by meiosis**, each **gamete will have a haploid number of chromosomes** and **each egg or sperm** will be **genetically different from the other**.
- Both the **egg and sperm have 23 chromosomes each**.

INTRODUCTION:

- Therefore when the **haploid sperm fuses with the haploid egg a diploid zygote is formed**.
- The **cycle starts over**.
- Humans show a **great deal of variation** and for **each cell** in the body of every human has **46 chromosomes**.

This is possible because …

1. Meiosis is responsible for halving the chromosome number, thus prevents the doubling effect
2. Meiosis is responsible for variation because it ensures that the sex cells are different from each other.

TERMINOLOGY:

TERM: **Sexual reproduction**	
DEFINITION: is reproduction that occurs with the use of gametes	USE IN SENTENCE: Humans undergo sexual reproduction.

TERMINOLOGY:

TERM: **Puberty**	
DEFINITION: refers to the period during which sexual maturity occurs.	USE IN SENTENCE:

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

- The male reproductive system is made up of…

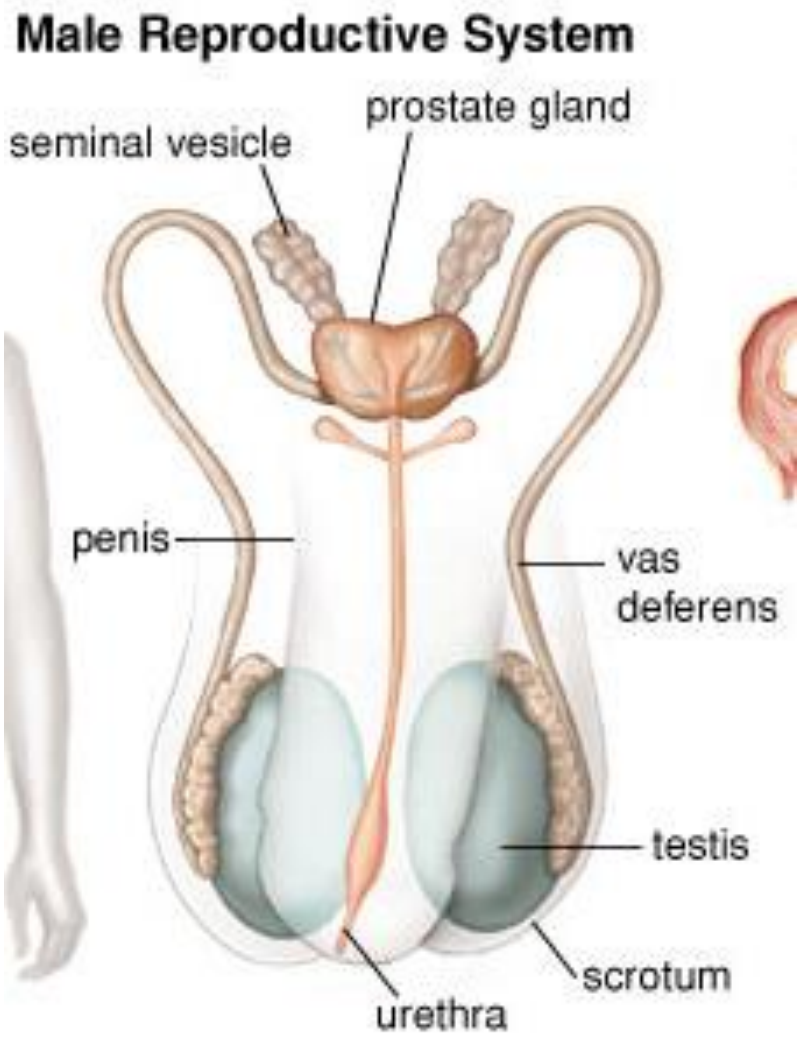
1. Tubes
2. Glands
3. Organs

- Lets look at each of these in some detail.

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

- From the diagram we can see that the male reproductive system is made up of the …

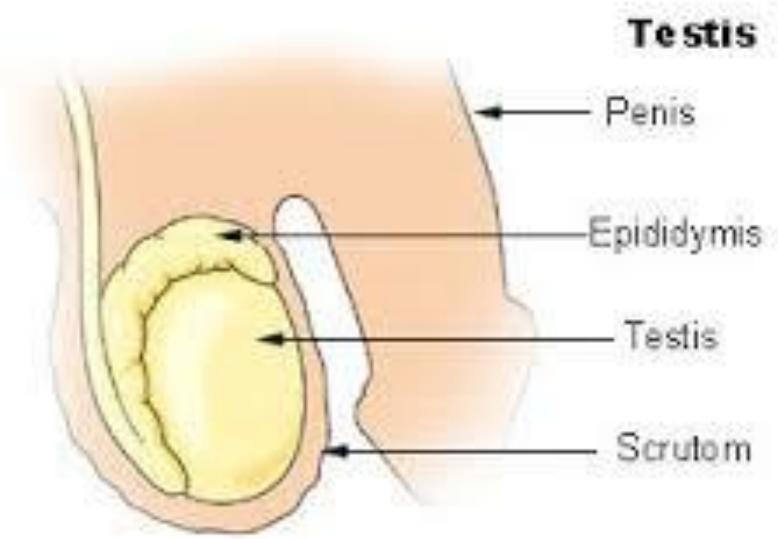
1. Testes
2. Vas deferens, ejaculatory duct, and urethra
3. Seminal vesicles, prostate gland and Cowpers gland
4. The penis.



STRUCTURE OF MALE REPRODUCTIVE SYSTEM

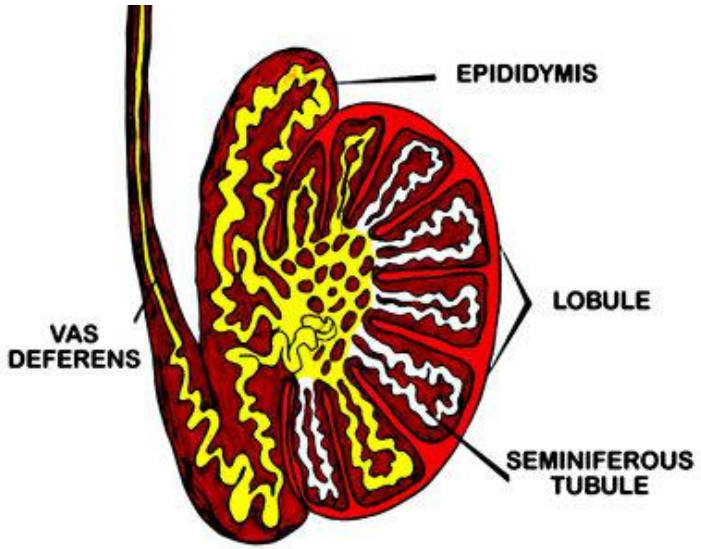
1. **The Testes…**

- There are a **pair of testes**.
- These are the **male sex organ**.
- They are also **referred to as the male gonads**.
- The **testes lies outside the abdominal cavity**.
- They are **covered** by a **sac-like structure** called the **scrotum**.



STRUCTURE OF MALE REPRODUCTIVE SYSTEM

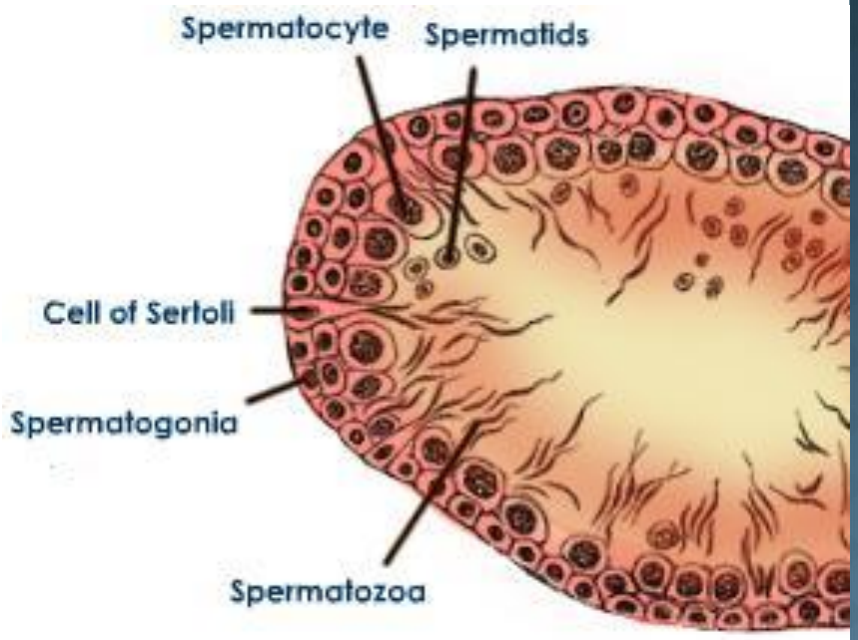
- **Inside each testes** there a **number of small tubules**.
- These are called the **seminiferous tubules**.
- The **seminiferous tubules** are **lined** by the **germinal epithelium**.



T/S testes

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

- The **germinal epithelium** is **responsible** for the **production of the spermatozoa (sperms)**.
- The **sperms** are produced by a **process called spermatogenesis**.
- **Specialized cells** are **found within** the **seminiferous tubules**.



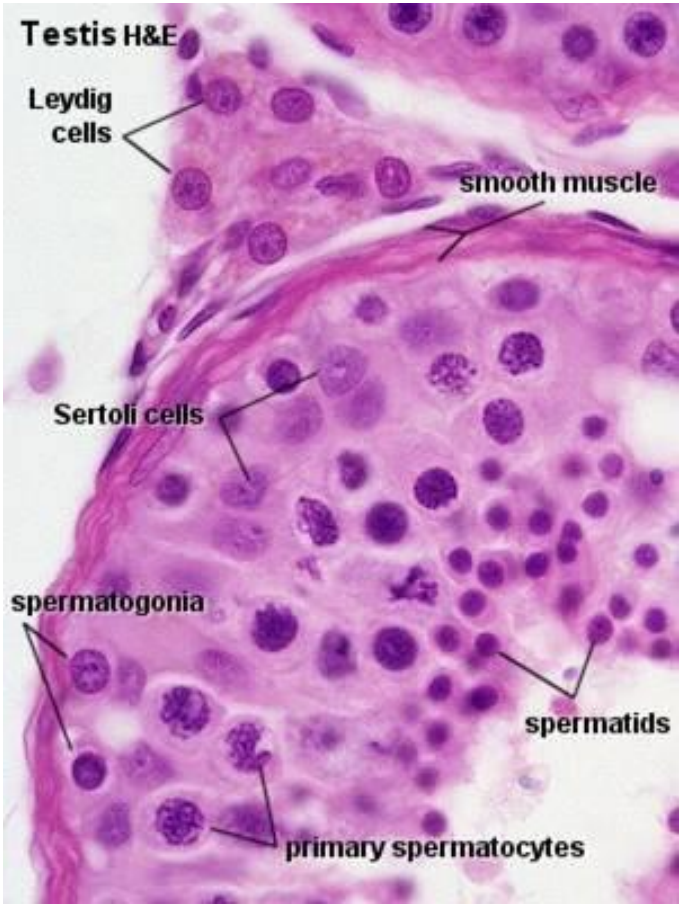
T/S Seminiferous tubules

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

- These cells are called the **cells of Sertoli**.
- The **cells of Sertoli** are **rich in glycogen**.
- Remember **glycogen is a form of glucose**.
- Therefore it is thought that the **cells of Sertoli provide the spermatids with nutrients**.
- We will discuss the spermatids later.
- For now know that they eventually **develop into the spermatozoa**.

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

- **Interstitial cells** are **found between** the **seminiferous tubules**.
- These **interstitial cells** are called the **Leydig cells**.
- The **Leydig cells secrete testosterone**.
- **Testosterone** is the **male sex hormone**.



T/S seminiferous tubules

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

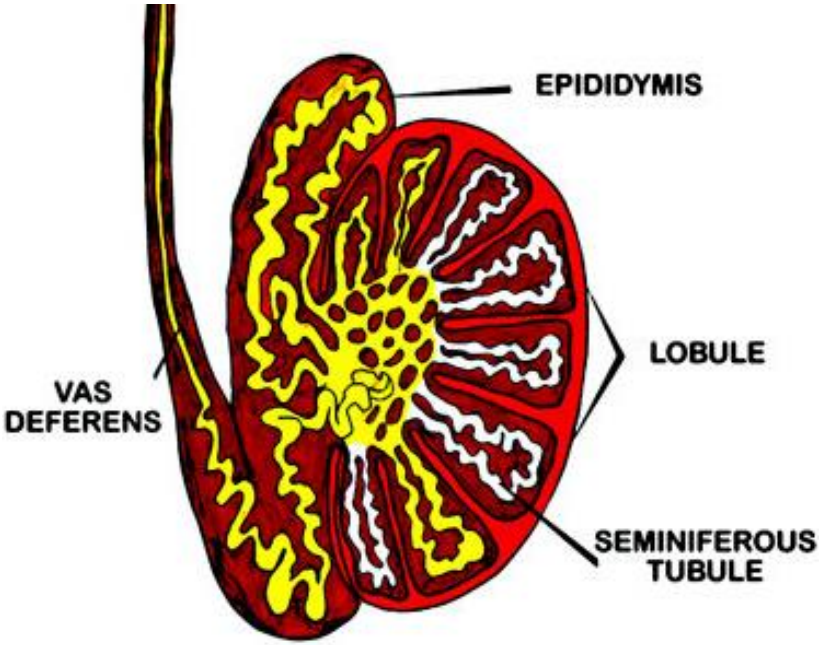
- **Testosterone** is **responsible** for the **development of secondary male characteristics** during **puberty**.

Some of these secondary male characteristics are…

1. Growth of hair on the face, armpits and pubic areas
2. Deepening of the voice
3. Development of muscles

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

- The **spermatozoa that are produced** in the **seminiferous tubules**, are **stored** for a **short while in the epididymis**.
- The **epididymis** is a **coiled tube** that **lies outside the testes** but **within the scrotum**.
- From the **epididymis** the **sperms pass into the vas deferens**.



T/S testes

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

- The **vas deferens** is also known as the **sperm duct**.
- The **vas deferens or sperm ducts** carry the **sperm from the epididymis to the ejaculatory duct**.
- From the diagram we can see that there are **2 ejaculatory ducts**.

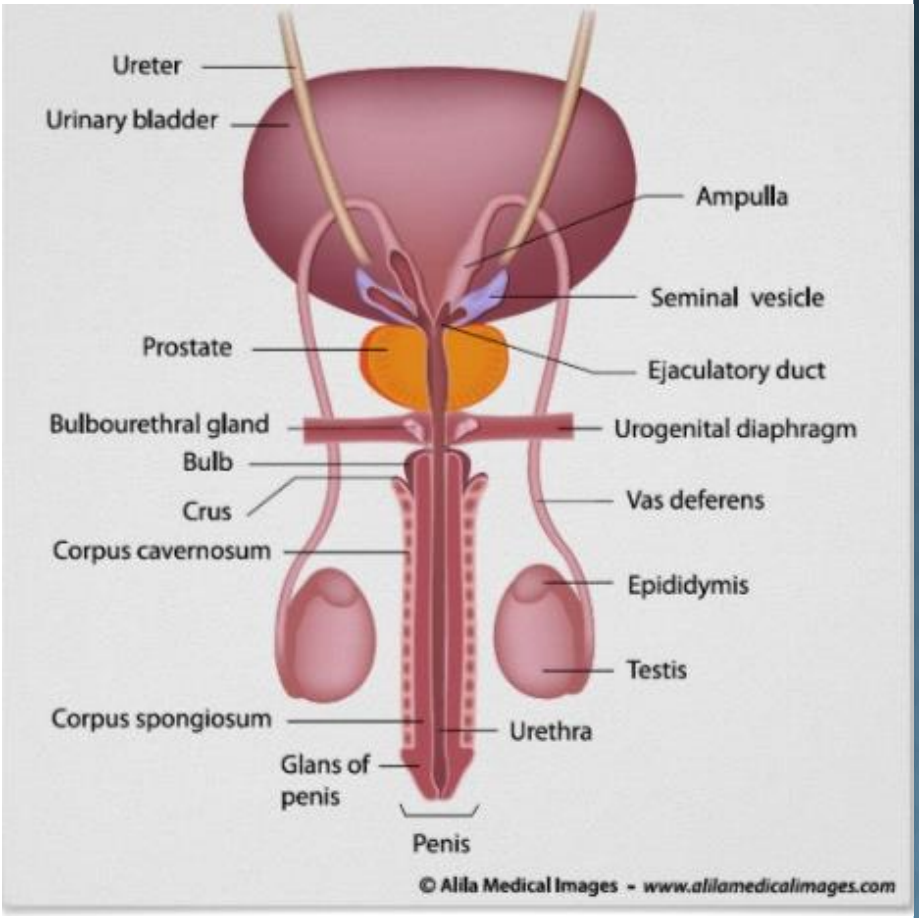


Diagram of Male Reproductive System

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

- The **ejaculatory ducts joins** the **urethra** just **after it leaves the bladder**.
- The **ejaculatory duct** is made up of **muscular walls**.
- The **ejaculatory duct carries** the **sperm together with its secretion**.
- The **sperms together with the secretion** of the **various glands** it **passes** is called **semen**.
- When the **muscular wall of the ejaculatory ducts contract** the **semen is forced through the urethra**.

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

- The **urethra** is a **common tube** for **both semen and urine**.
- It **runs from the bladder to the exterior**.
- It **runs through the penis**.
- As the **sperm travels through the vas deferens** and **ejaculatory ducts** it passes the **accessory glands**.

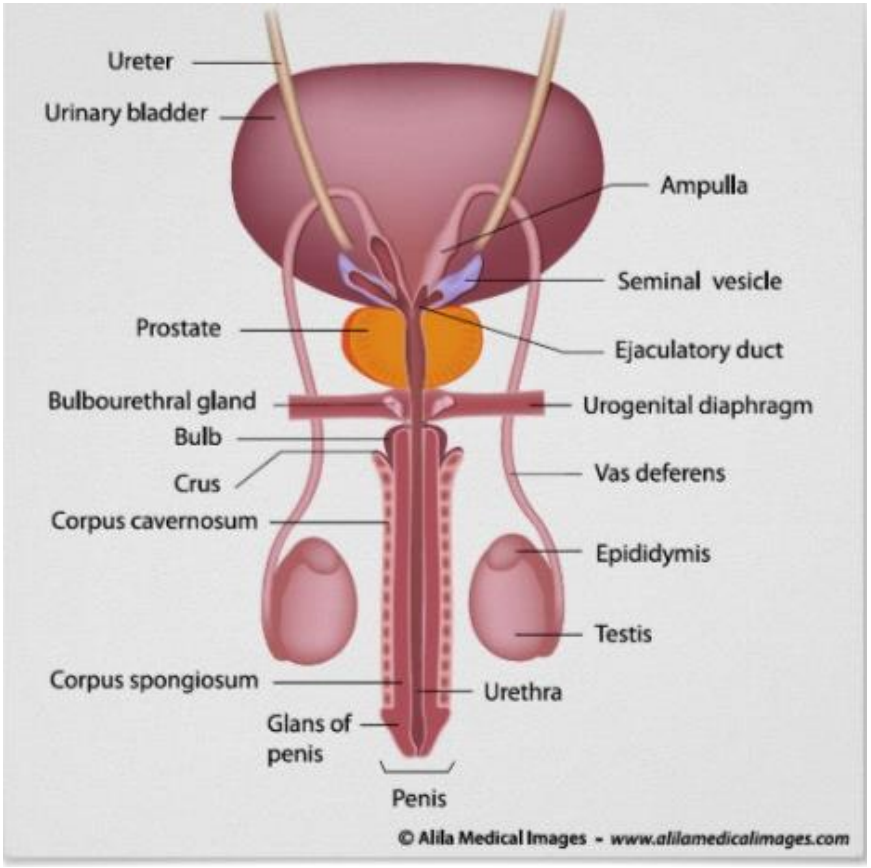


Diagram of Male Reproductive System

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

- The **accessory glands** are **the Cowpers gland, the seminal vesicles and the prostate glands**.
- These **glands pour their secretions into the vas deferens and ejaculatory duct**.
- **Collectively** the **fluid** that is secreted has **2 functions**.

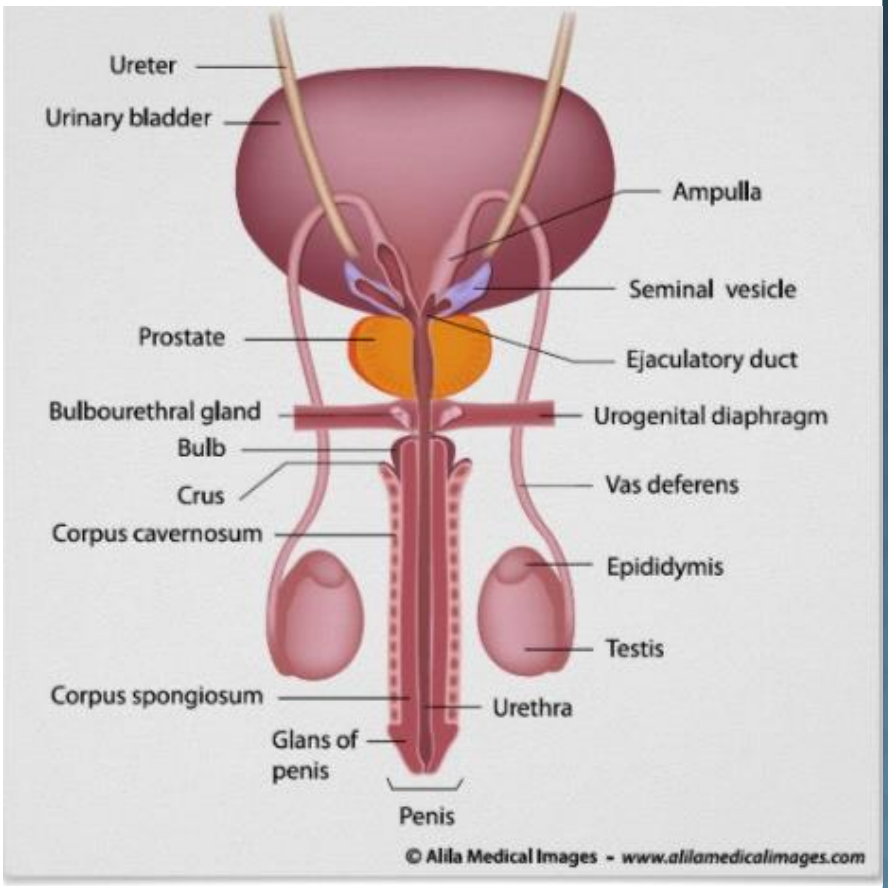


Diagram of Male Reproductive System

STRUCTURE OF MALE REPRODUCTIVE SYSTEM

These 2 functions are…

1. Promotes the movement of the sperm
2. Provides the sperm with nutrients.

- The **penis** is the **external male reproductive organ**.
- It is made up of **spongy tissue**.
- The **penis** becomes **erect** when the **tissue fills with blood**.
- This occurs **before the penis is inserted into the vagina**.
- The **function** of the **penis** is to **transfer the semen to the female**.

SOMETHING FOR YOU TO DO:

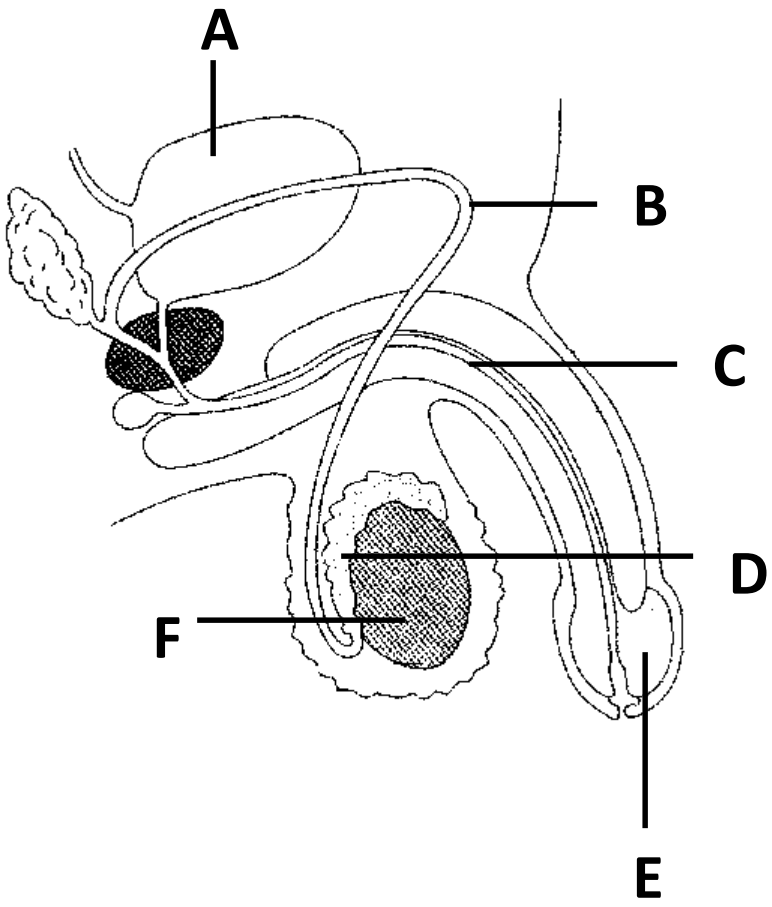
Study the diagram of the male reproductive system below.

1.4.1 Write down the LETTER (A to G) and the NAME of the following:

(a) The part where meiosis takes place

(b) The part that transports semen and urine to the outside of the body

(c) The part where immature sperm cells are stored



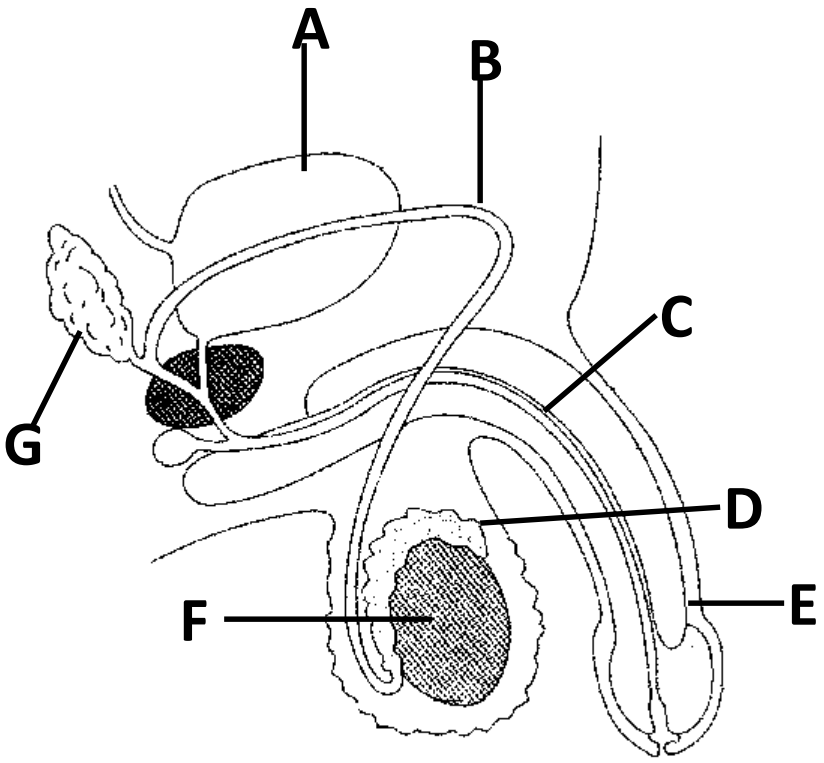
SOMETHING FOR YOU TO DO:

1.4.2 Name the male hormone that is responsible for the development of secondary sexual characteristics during puberty.

1.4.3 Write down the LETTER (A to G) of the following:

(a) The part where the hormone mentioned in QUESTION 1.4.2 is produced

(b) The part which is cut surgically during male sterilization.



SOLUTION:

1.4.1 (a) F testis/seminiferous tubules

(b) C urethra

(c) D epididymis

1.4.2 Testosterone

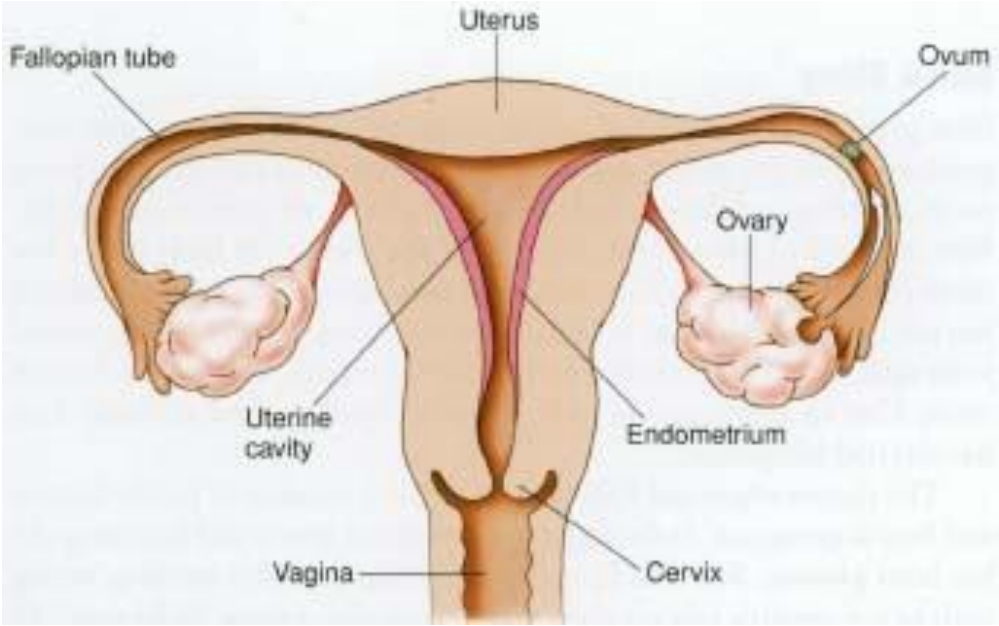
1.4.3 (a) F

(b) B

STRUCTURE OF FEMALE REPRODUCTIVE SYSTEM

The female reproductive system is made up of the following structures…

1. A pair of ovaries
2. The fallopian tube oviduct
3. The uterus
4. Vagina
5. The vulva



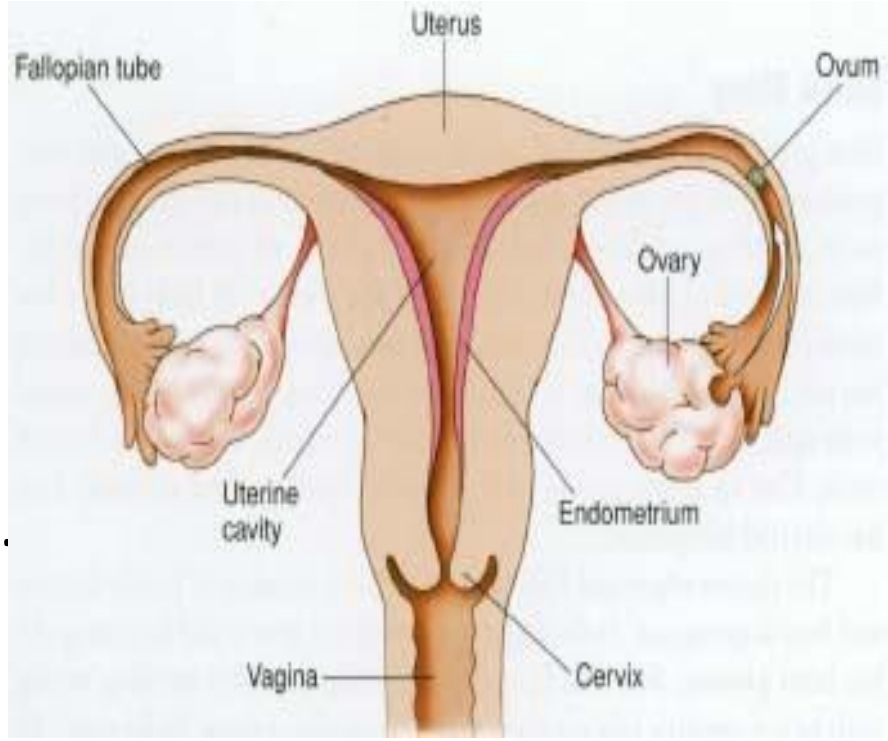
The female reproductive system

Now lets look at each of these structures.

STRUCTURE OF FEMALE PRODUCTIVE SYSTEM

1. **The Ovaries…**

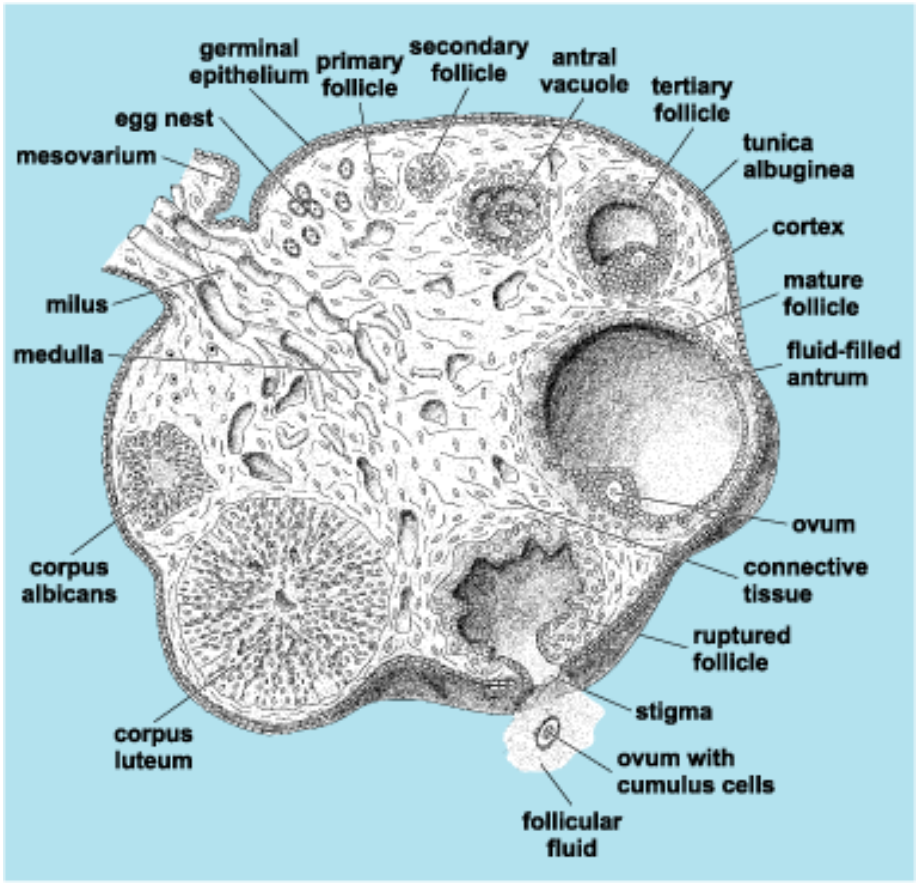
- There are a **pair of ovaries**.
- These are the **female gonads**.
- They are **found in the lower abdomen**.
- They are **held in position by ligaments**.
- They are **responsible for the production of eggs or ova**.



The female reproductive system

STRUCTURE OF FEMALE PRODUCTIVE SYSTEM

- **Each ovary** is **lined** with the **germinal epithelium**.
- The germinal epithelium **produces the follicles**.
- The **follicles produce the egg or ova** by a process called **oogenesis**.
- The **follicles** also **secrete 2 hormones**.



Ovary showing development of egg

STRUCTURE OF FEMALE PRODUCTIVE SYSTEM

- These **2 hormones** are called…

1. Oestrogen
2. Progesterone

- These **hormones** are **responsible for secondary female characteristics**.

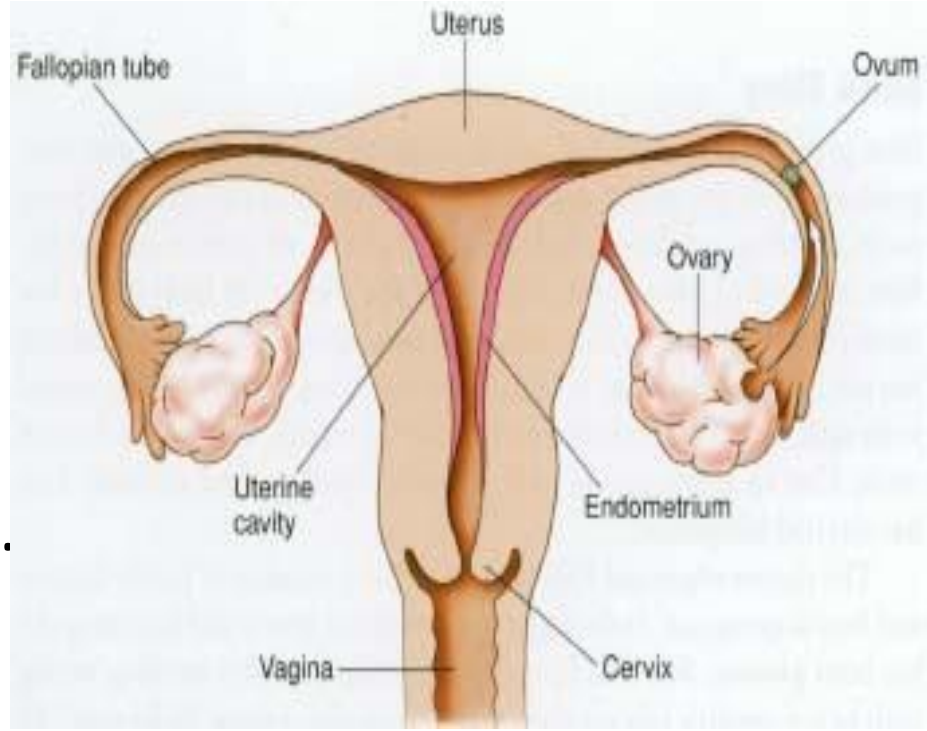
The secondary female characteristics are…

1. Increase in the size of breasts
2. Development of pubic hair and hair in the armpits
3. Menstruation

STRUCTURE OF FEMALE PRODUCTIVE SYSTEM

2. **The Fallopian Tubes**

- There are **2 fallopian tubes**.
- They **lead from the ovary to the uterus**.
- They **transport the egg from the ovary to the uterus**.

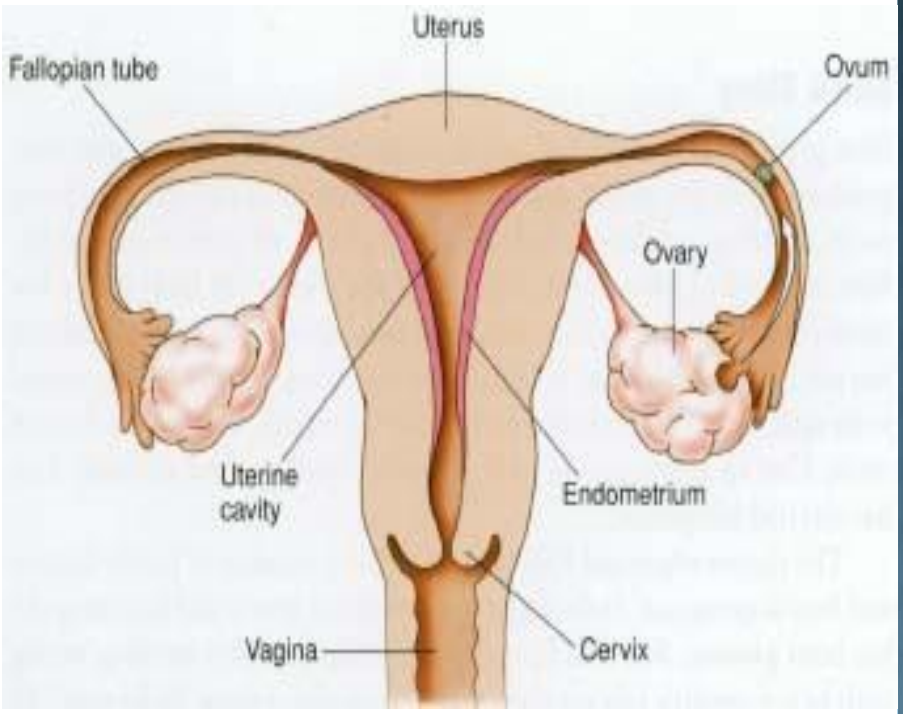


The female reproductive system

STRUCTURE OF FEMALE PRODUCTIVE SYSTEM

3. **The Uterus…**

- The **uterus** is a **hollow pear shaped organ**.
- It has **thick muscular walls**.
- The **lining of the uterus** is called the **endometrium**.



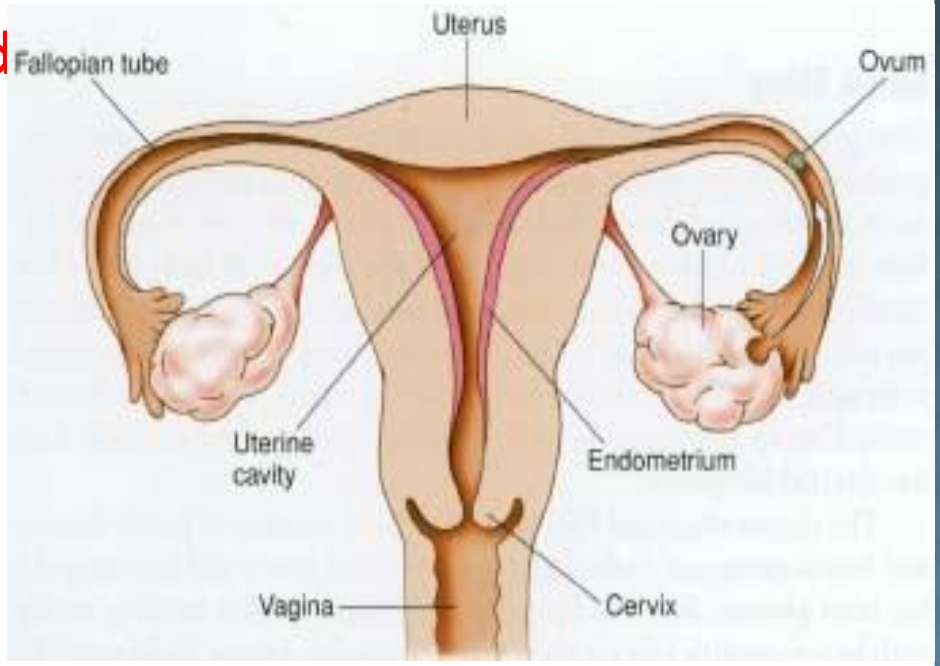
The female reproductive system

STRUCTURE OF FEMALE PRODUCTIVE SYSTEM

- The **neck of the uterus** is called the **cervix**
- The **embryo** is **attached to the wall** of the **uterus**.
- The **uterus is leads to the vagina**.

4. **The Vagina…**

- The **vagina** is also called the **birth canal**.



The female reproductive system

SOMETHING FOR YOU TO DO:

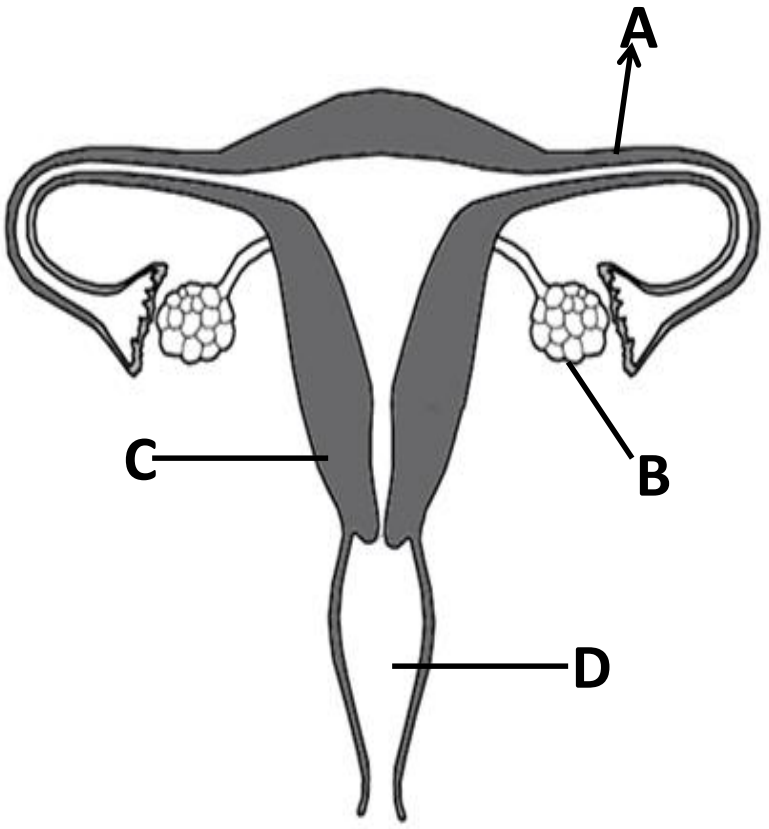
The diagram below shows the structure of the female reproductive system. **Give the LETTER and NAME of:**

1.4.1 The part that breaks down when the levels of progesterone and oestrogen drop

1.4.2 The part that plays a role during copulation

1.4.3 The part where the zygote will be formed

1.4.4 The part where the Graafian follicles develop



SOLUTION:

1.4.1 C – Endometrium

1.4.2 D – Vagina

1.4.3 A – Fallopian tube

1.4.4 B – Ovary

STRUCTURE OF FEMALE PRODUCTIVE SYSTEM

- The **vagina receives the semen during copulation**.
- The **vagina leads to the outside** via an opening.
- This opening is called the **vulva**.

MAIN CHANGES THAT OCCUR DURING PUBERTY

- As mentioned earlier **puberty is the period during which sexual maturity occurs**.
- It usually occur between **11 to 15 years of age**.
- However these **ages are just averages**.
- Everyone **reaches puberty at a different age**.
- Puberty can occur as **early as 9 or as late as 19 years old**.
- In **females** puberty **starts between 10 or 11 and usually is completed by 15 to 17 years of age**.
- While in **males puberty** can **begin between ages 11 to 12 and is completed by the ages 16 to 17 years of age**.

MAIN CHANGES THAT OCCUR DURING PUBERTY

Lets look at some of the changes that occur in both males and females during puberty.

Males:

1. Development of pubic hair, this is the growth of hair around the scrotum.
2. Growth of hair in the armpits and on the face.
3. Deepening of the voice
4. Development of muscles and broadening of the shoulders.

MAIN CHANGES THAT OCCUR DURING PUBERTY

Females:

1. Growth of pubic hair, this is hair around the vagina.
2. Growth of hair in armpits.
3. Increase in the size of the breasts.
4. Onset of menstruation.

GAMETOGENESIS

- **Gametogenesis** refers to the **process by which gametes are produced** from the **germinal epithelium of the male and female gonads or sex organs**.
- There are 2 types of gametogenesis .

These are…

1. Spermatogenesis
2. Oogenesis

- **Spermatogenesis** is process by which the **spermatozoa are produced** from the **germinal epithelial of the testes**.

GAMETOGENESIS

- **Oogenesis** is the process during which the **eggs or ova are produced** from the **germinal epithelium of the ovary**.

Now lets look at each of these processes.

Spermatogenesis…

Spermatogenesis occur in the following way…

- The cells of the **germinal epithelium lining** the **seminiferous tubules divide** by **meiosis**.
- **Each cell** divides to form **4 haploid cells**.

GAMETOGENESIS

- **Each haploid cell** is called a **spermatid**.
- The **spermatids** then **matures to form spermatozoa**.

Structure of Spermatozoa

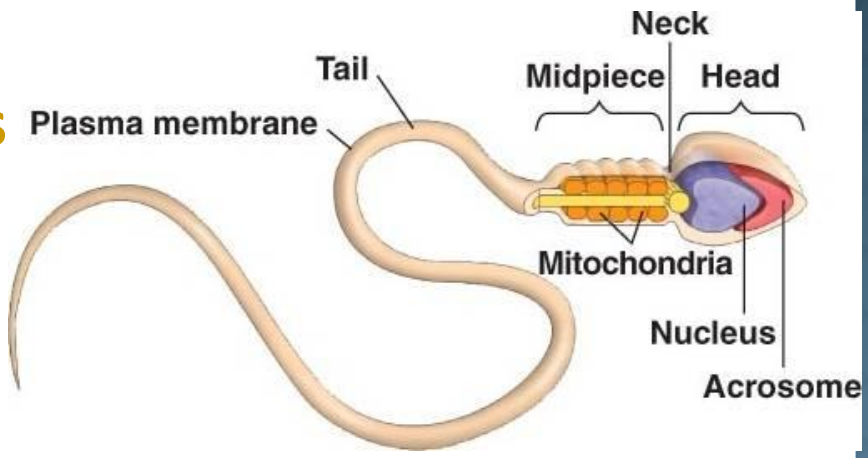
- Remember that **the spermatozoa are also called sperms**.
- Each sperm is made up of **3 parts**.

These 3 parts are the…

1. Head
2. Middle piece and
3. Tail

GAMETOGENESIS

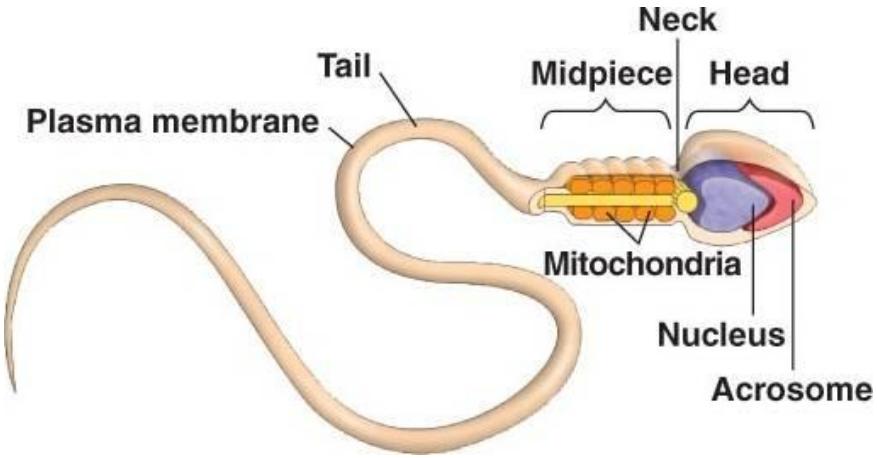
- The **head** is made up of a **nucleus**.
- The **nucleus has 23 chromosomes**.
- These are **22 autosomes and a gonosome** which **maybe X or Y**.
- The **head** also **contains the acrosome**.
- The **acrosome** has an **enzyme** that **plays a role in penetrating the ovum**.



A Sperm

GAMETOGENESIS

- The **middle piece** has a **large number** of **mitochondria**.
- The **mitochondria contains mitochondrial DNA**.
- The **mitochondria provides energy** for **movement of the sperm**.
- The **tail is long** and is **used for swimming**.



A Sperm

GAMETOGENESIS

- A common question asked here is **to draw and label the sperm**.
- Please **learn to draw and label the sperm**.

Remember by drawing an learning the labels you will be able to describe the structure of the sperm to!!!

GAMETOGENESIS

Oogenesis:

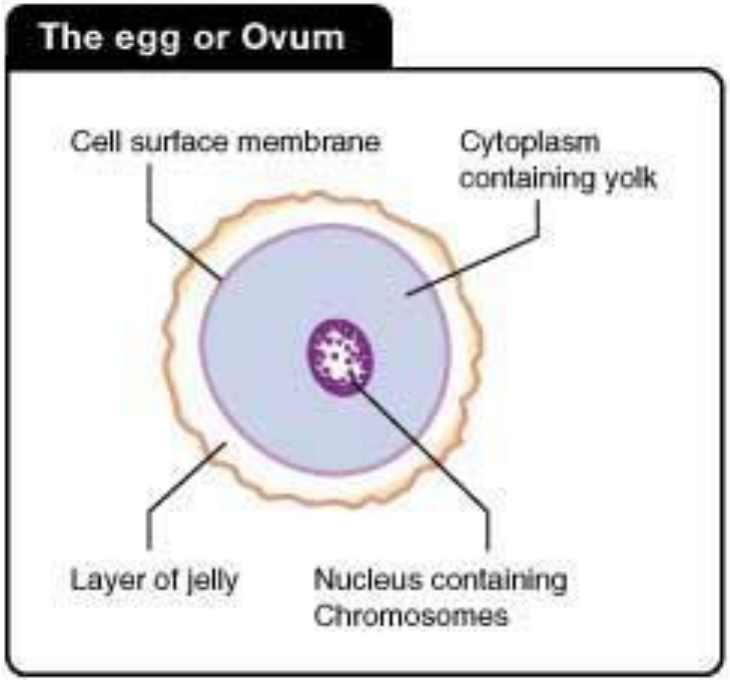
- Oogenesis is the **process during which the germinal epithelium of the ovary gives rise to the egg or ovum**.

The process occurs as follows…

1. The **germinal epithelium** of the **ovary produces a large number of follicles**.
2. The **follicles** are produced as a result of **mitosis**.
3. A **single cell inside the follicle enlargens**.

GAMETOGENESIS

4. The **enlargened cell undergoes meiosis**.
5. Therefore **4 haploid cells are produced**.
6. Only **one cell survives**.
7. This **cell develops into a mature ovum or egg**.



TERMINOLOGY:

TERM: **Gametogenesis**	
DEFINITION: refers to the process by which gametes are produced from the germinal epithelium of the male and female gonads or sex organs.	**USE IN SENTENCE:** Both eggs and sperms are produced by types of spermatogenesis.

TERMINOLOGY:

TERM: **Spermatogenesis**	
DEFINITION: is process by which the spermatozoa are produced from the germinal epithelial of the testes.	**USE IN SENTENCE:** Spermatogenesis gives rise to the sperms

TERMINOLOGY:

TERM: **Oogenesis**	
DEFINITION: is the process during which the eggs or ova are produced from the germinal epithelium of the ovary.	**USE IN SENTENCE:** Oogenesis results in the formation of eggs.

MENSTRUAL CYCLE

- The **menstrual cycle** refers to the **changes that occur in the ovary and uterus** of a **female over a period of 28 days**.
- The **menstrual cycle** is actually **made up of 2 cycles**.

These 2 cycles are the…

1. Ovarian cycle and
2. Uterine cycle.

Lets look at each of these cycles.

MENSTRUAL CYCLE

The Ovarian Cycle:

- The **ovarian cycle** describes the **changes that occur within the ovary** during the **development of the egg within** the **Graafian follicle**.
- The **ovarian cycle** is **controlled by 2 hormones**.
- These **2 hormones** are the **follicle stimulating hormone** and the **luteinising hormone**.

MENSTRUAL CYCLE

- The **follicle stimulating hormones** is also known as the **FSH**.
- The **FSH** is **produced** by the **hypophysis or pituitary gland**.
- The **FSH** is **responsible for the development** of a **large sac like structure** called the **Graafian follicle**.
- The **germinal epithelium** gives rise to the **follicles**.
- **One follicle develops** into **large follicle** called the **Graafian follicle**.

MENSTRUAL CYCLE

- The **egg or ovum** is **found within** the **Graafian follicle**.
- The **Graafian follicle** then **secretes a hormone** called **oestrogen**.
- The **oestrogen** is **involved in preparation** of the **uterus for pregnancy**.
- This is achieved by making the endometrium…

a. Thicker
b. Having an increased supply of blood vessels
c. More glandular

MENSTRUAL CYCLE

- **After about 14 days** the **Graafian follicle raptures to release an egg**.
- This process is called **ovulation**.
- **Ovulation** is the **process** during which the **mature egg is released from the Graafian follicle**.
- The **funnels of the fallopian tube collects the egg**.
- The **ruptured Graafian follicle becomes** the **corpus luteum**.
- The **conversion of the ruptured Graafian follicle into the corpus luteum** is **controlled by a hormone**.

MENSTRUAL CYCLE

- This **hormone** is called the **luteinising hormone**.
- This **hormone is produced** by the **pituitary gland**.
- The **corpus luteum secretes a hormone**.
- This hormone is called **progesterone**.
- The **function of progesterone** is to **maintain pregnancy**.
- If **fertilization does not occur** the **corpus luteum breaks down**.

MENSTRUAL CYCLE

- Then **progesterone is no longer secreted**.
- The **unfertilized egg** then **leaves the body by a process called menstruation**.

The Uterine Cycle and Menstruation:

- The **uterine cycle** refers to the **changes** that occur in the **walls of the uterus** as it **thickens until menstruation occurs**.
- If the **egg is fertilized** then the **corpus luteum continues to produce progesterone**.

MENSTRUAL CYCLE

- **Progesterone** ensures that the **egg remains attached to the uterine wall**.
- In other words **progesterone maintains pregnancy**.

BUT…

- If **fertilization does not occur** then the **corpus luteum ruptures**.
- Then the **secretion of progesterone** **stops**.
- Then **menstruation occurs**.

MENSTRUAL CYCLE

- **Menstruation** refers to the **discharge of blood and other material from the lining of the uterus** at **intervals of about one month**.
- **Menstruation starts** during **puberty between 11 to 14 years**.
- But in **some females may start as early as 9** years of age but **other females may start as late as 21 years of age**.
- Menstruation **occurs 14 days after ovulation**.
- Menstruation **lasts between 5 to 7 days**.

MENSTRUAL CYCLE

- The **new ovum** is then **released 14 days after menstruation**.
- When a **female stops menstruating**, this means that the **ovaries no longer produce the eggs** this is known as **menopause**.
- Menopause occurs **between ages 45 and 55**.

MENSTRUAL CYCLE

Here is another way to look at the menstrual cycle.

- The **first day** of the **menstrual bleed** is the **start** of the **menstrual cycle**.
- The **menstrual bleed may last between 5 to 7 days**.
- The menstrual bleed is also called a **period**.
- About **14 days later the egg is released** from the **Graafian follicle**.
- This process is called **ovulation**.
- The **egg is captured by the funnels of the fallopian tube**.

MENSTRUAL CYCLE

- The **ruptured Graafian follicle** is **converted** to the **corpus luteum**.
- This **conversion is controlled** by the **luteinising hormone**.
- The **corpus luteum** is responsible for the **secretion of the hormone progesterone**.
- The **progesterone** is **responsible for maintaining pregnancy**.
- But if **fertilization does not occur** then the **corpus luteum ruptures**.
- **No progesterone** is released.

MENSTRUAL CYCLE:

- Therefore **unfertilized egg together with the blood vessels will leaves the body through the vagina**.
- This process is called **menstruation**.

To summarize…

- The **ovarian cycle** describes the **formation of the ovum within the ovary** until it is **released and the corpus luteum is formed**.
- The **uterine cycle** describe the **changes that occur in the uterine wall** as the **body prepare itself for pregnancy**.
- **Both** the **ovarian and uterine cycle makes up** the **menstrual cycle**.

MENSTRUAL CYCLE:

- The **hormones progesterone and oestrogen** are **involved in maintaining pregnancy**.
- The **hormones FSH and LH controls the menstrual cycle**.

We have discussed the menstrual cycle a number of times and a number of different because it is so difficult to understand.

Hopefully you will find something you understand here!

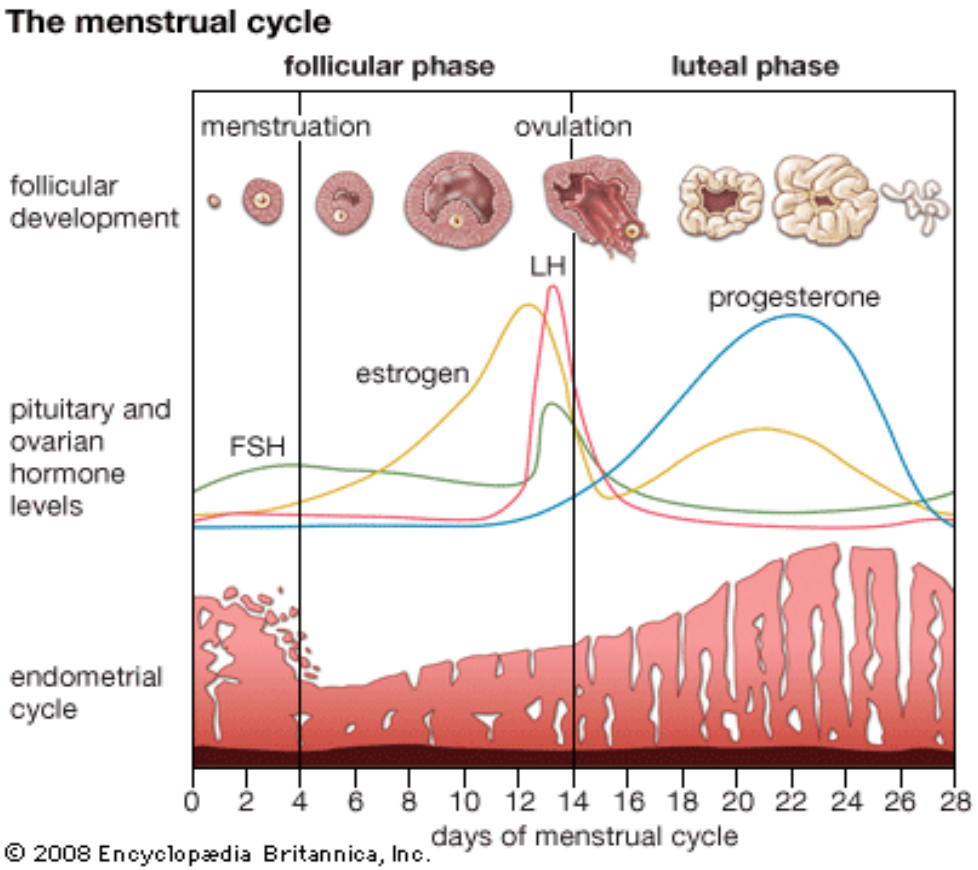
SOMETHING EXTRA

- Now lets look at some graphs that show us the relationship between the different cycles and the hormones that are a part of the menstrual cycle.

SOMETHING EXTRA:

The graph alongside shows use the following…

1. Changes in the endometrium
2. The changes in the levels of the 4 hormones, and
3. The development of the egg.



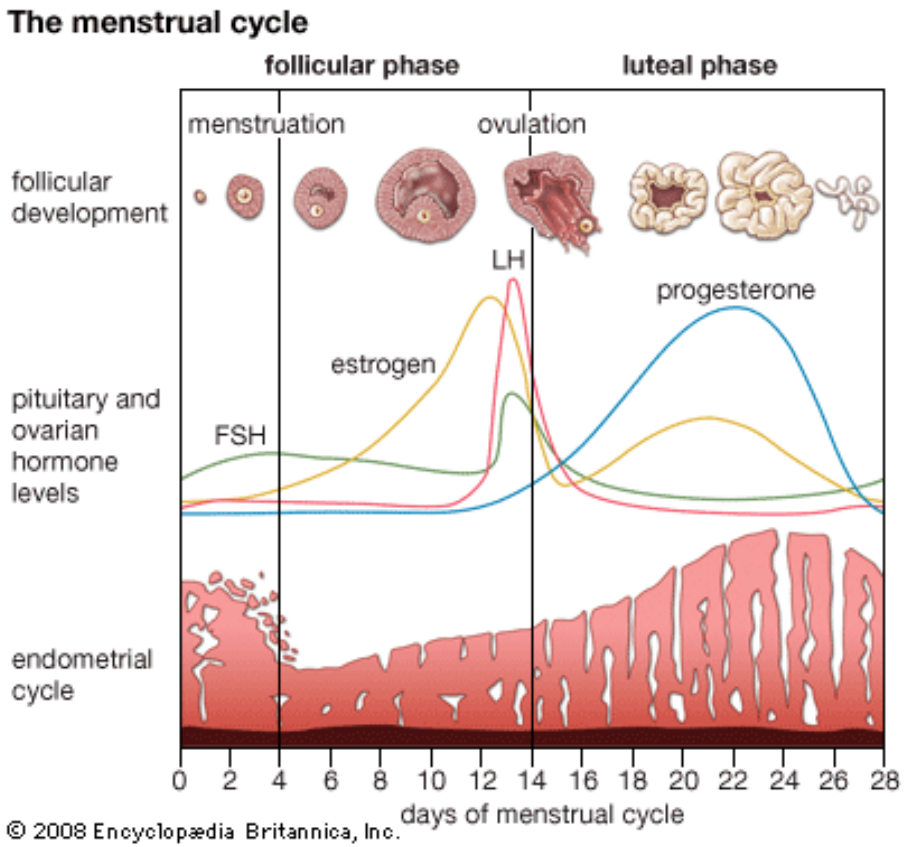
SOMETHING EXTRA:

If we start with the endometrium, we can make the following observations…

1. Menstruation lasts between day 1 to 4, it is

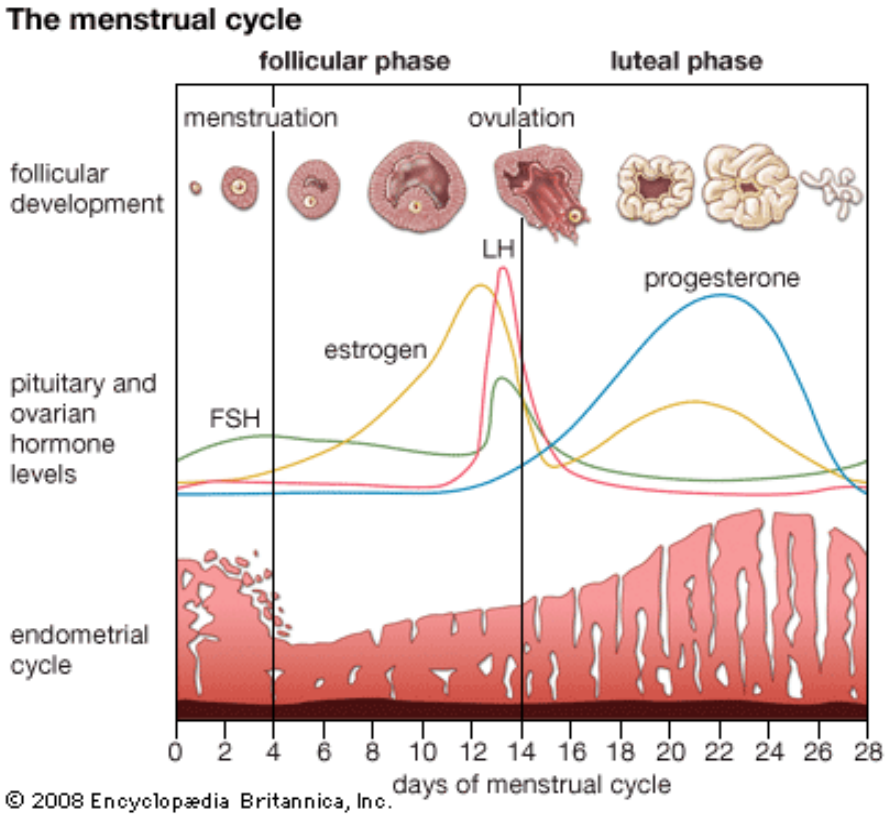
   recognizable by

   the drops seen on the graph.



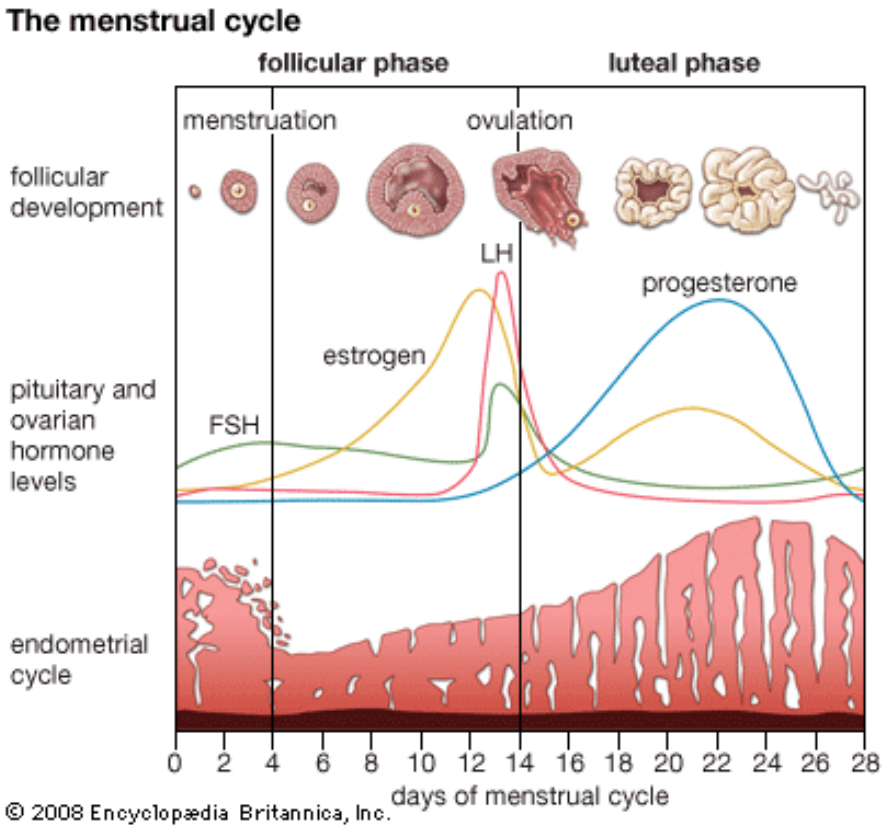
SOMETHING EXTRA:

2. At this point we find that **levels of FSH start to increase** and **then peaks** just **before ovulation** because it is **responsible for the production of the follicles**.
3. The **LH and FSH peak around the same time**, that is **just before ovulation**.



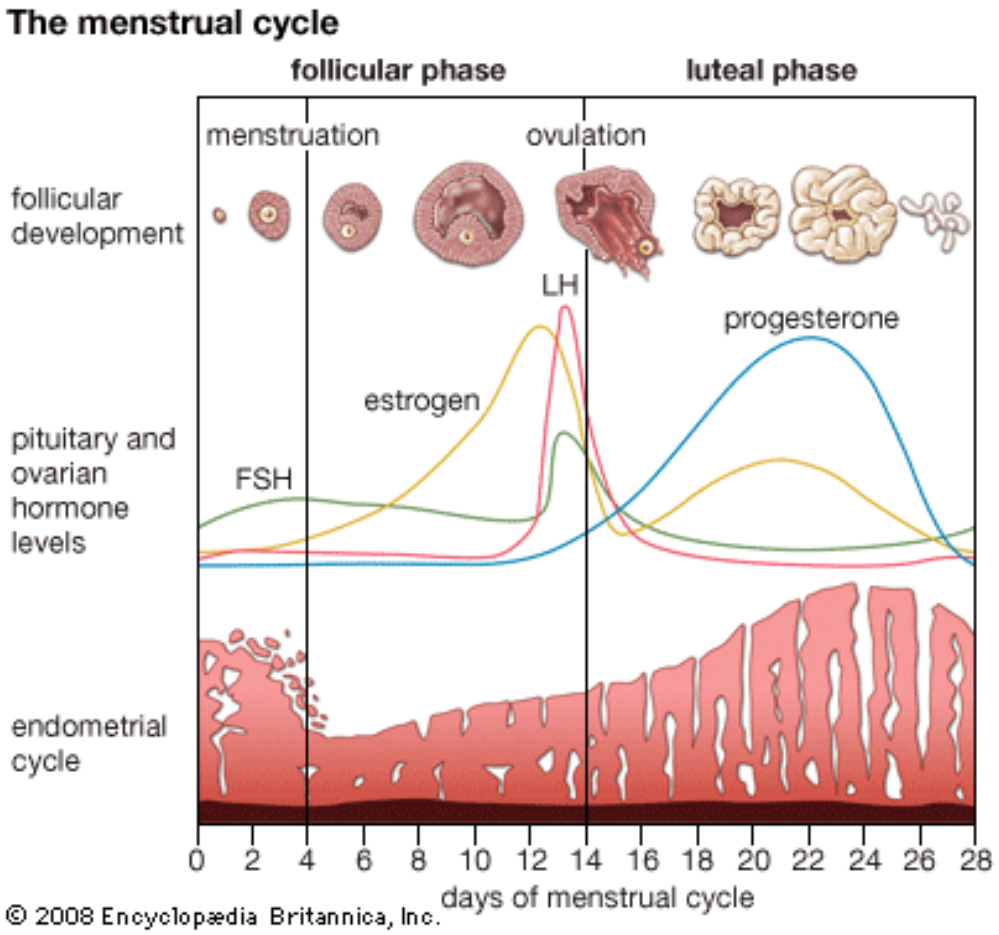
SOMETHING EXTRA:

4. Then **ovulation occurs** on **day 14**.
5. Then the **endometrium starts to thicken after day 14**.
6. **Look at the levels of oestrogen** you see that it **peaks just before ovulation** and is **responsible for the thickening of the endometrium**.



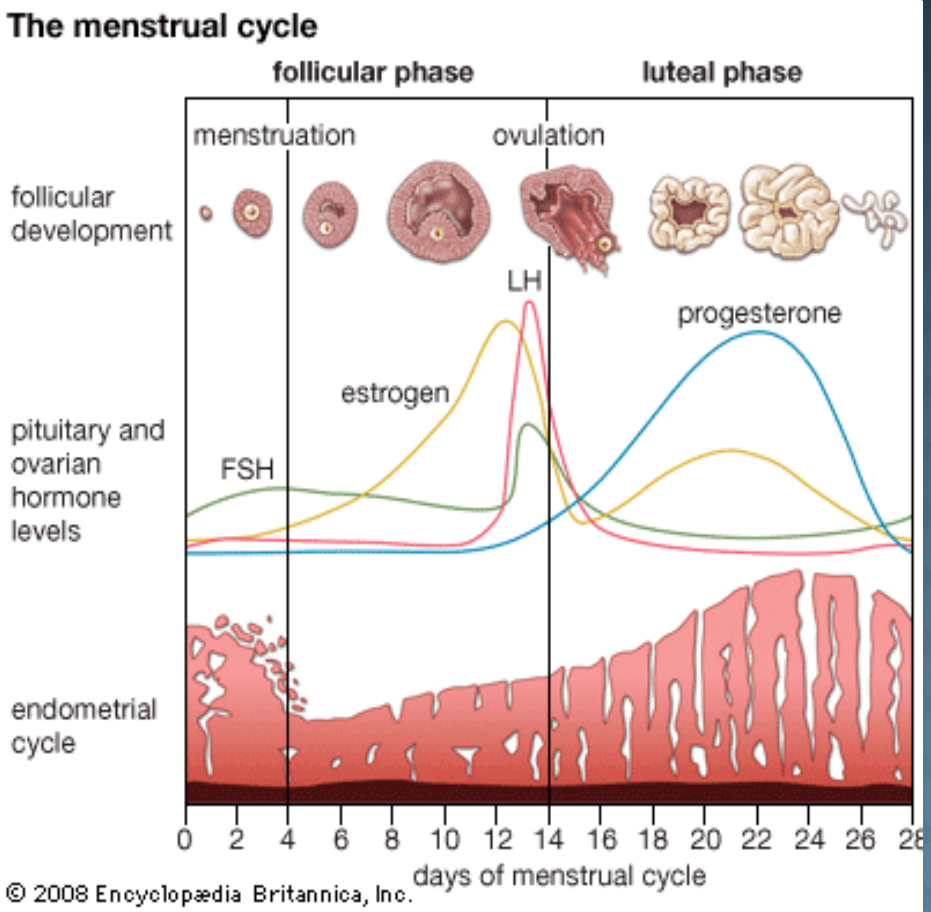
SOMETHING EXTRA:

7. On day **14 the levels of LH is high**, since **ovulation occurs** and it is **responsible for converting the Graafian follicle** into the **corpus luteum**.



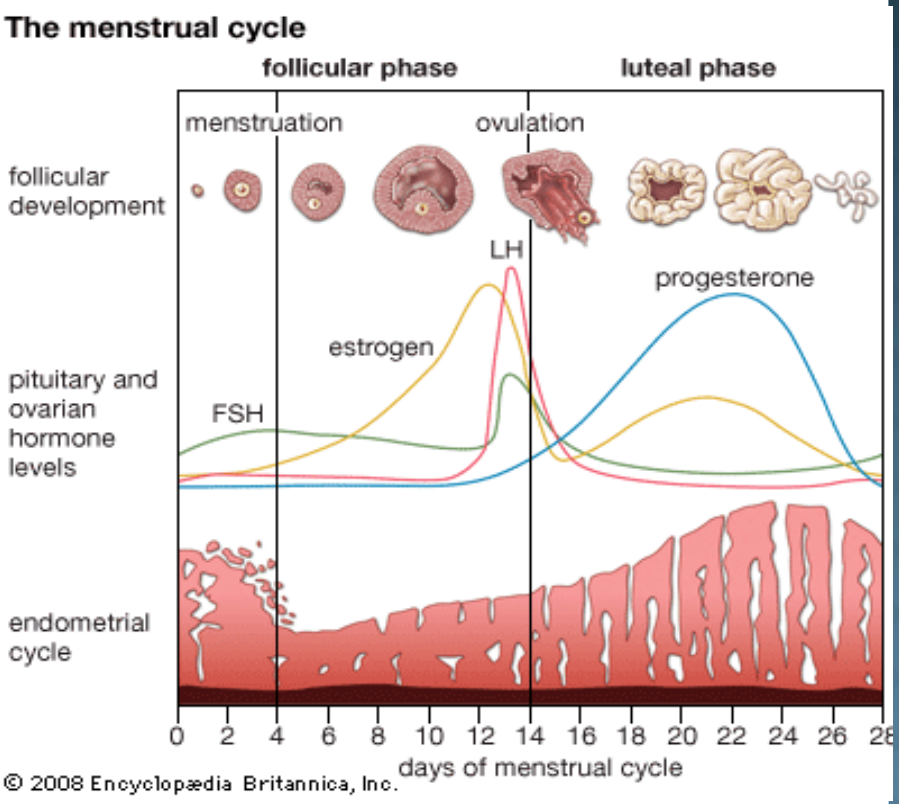
SOMETHING EXTRA:

8. **Look at the ovarian cycle**, you seen that the **corpus luteum is produced around day 16** and the **level of the hormone progesterone has peaked** because the **corpus luteum secretes progesterone**.



SOMETHING EXTRA:

9. From the graph we can see that **this female is not pregnant**.
10. This is because the **corpus luteum disintegrates**, **levels of progesterone decrease** and the **lining of the endometrium decreases**.
11. Also note that when the **levels of oestrogen and progesterone are high** the **levels of FSH and LH are low**.



SOMETHING EXTRA:

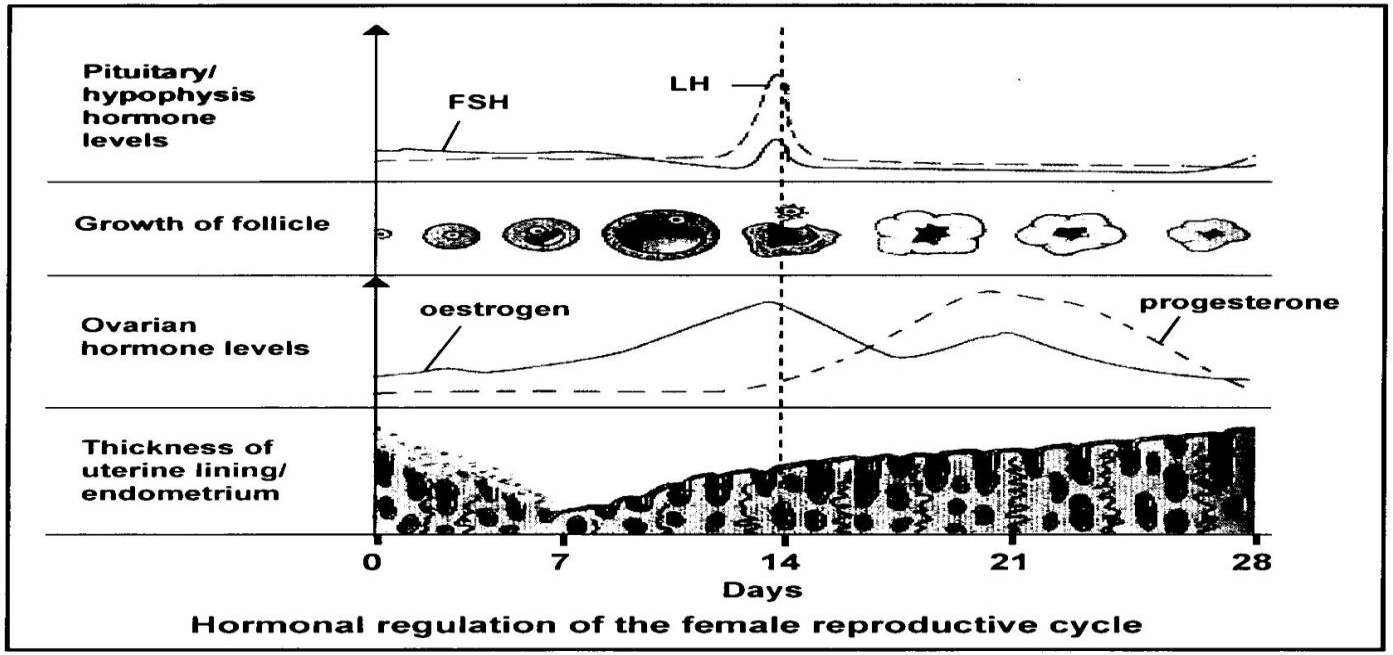
11. This is the reason why a woman does not menstruate when she is pregnant.
12. Also note that when the **levels of oestrogen and progesterone are high the levels of FSH and LH are low**.

- **It is extremely important to understand these graphs because many questions come out on this.**

- **Lets look at some examples.**

SOMETHING FOR YOU TO DO:

2.3 Study the graph below of a menstrual cycle and the influence of the different hormones on it.



Hormonal regulation of the female reproductive cycle

2.3.1	On which day does ovulation take place?	(1)
2.3.2	Between which days does menstruation take place?	(1)
2.3.3	State ONE function of FSH during the menstrual cycle.	(1)
2.3.4	Describe the functional relationship between progesterone and FSH.	(2)
2.3.5	Account for the change in the thickness of the endometrial lining between day 14 and day 21.	(2)
2.3.6	Did fertilisation take place within the 28-day cycle illustrated in the graph?	(1)
2.3.7	Give TWO reasons for your answer to QUESTION 2.3.6.	(2)
		(10)

SOLUTION:

2.3.1 Day 14/15

2.3.2 Day 0–6/day 0–7

2.3.3 Stimulates follicle/ovum development in the ovary/secretion of oestrogen

2.3.4 An increase in progesterone level inhibits the release of FSH

OR

FSH stimulates the development of the ovum and progesterone prepares for implantation when this ovum is fertilized

SOLUTION:

2.3.5 Corpus luteum- starts to secrete progesterone which thickens the lining of the uterus wall/endometrium

2.3.6 No

2.3.7 Corpus luteum has degenerated

Progesterone level has decreased

FSH level starts to rise

LH level decreases

TERMINOLOGY:

TERM: **Menstrual cycle**	
DEFINITION: refers the changes that occur in the ovary and uterus of a female over a period of 28 days.	**USE IN SENTENCE:** The menstrual cycle lasts about 28 days.

TERMINOLOGY:

TERM: **Ovulation**	
DEFINITION: is the process during which the mature egg is released from the Graafian follicle of an ovary.	**USE IN SENTENCE:** During ovulation a mature egg is released from the ovary.

TERMINOLOGY:

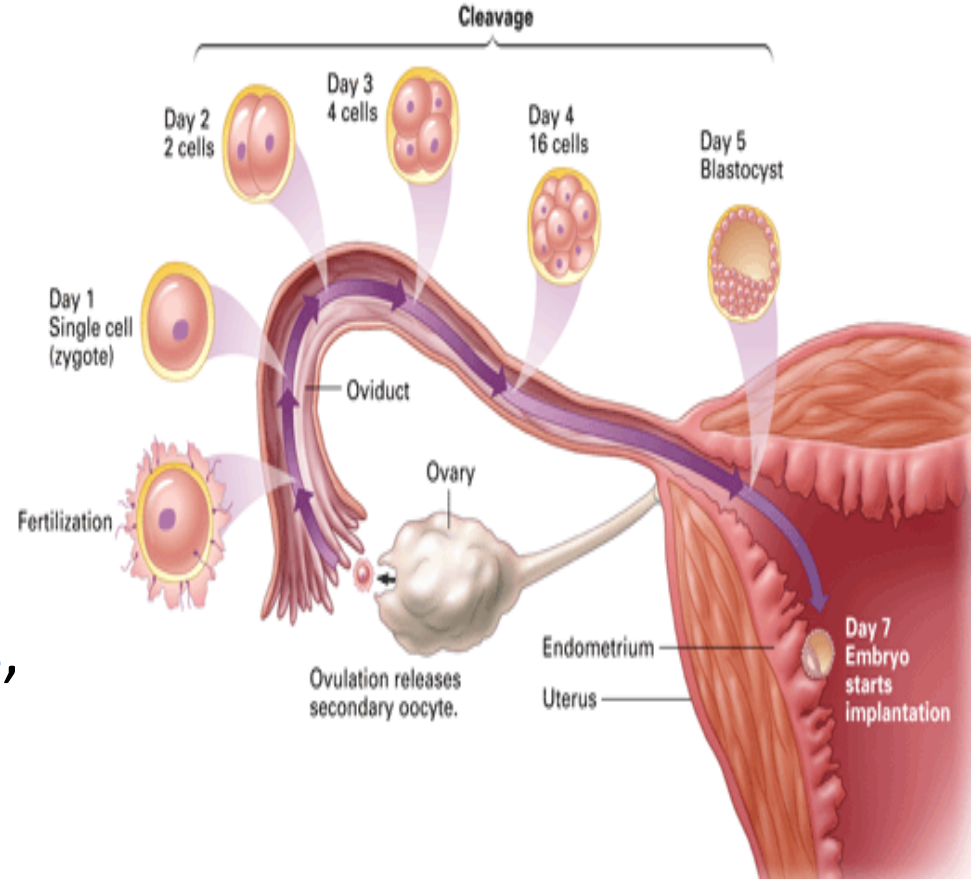
TERM: **The uterine cycle**	
DEFINITION: refers to the changes that occur in the walls of the uterus as it thickens until menstruation occurs.	**USE IN SENTENCE:** During the uterine cycle the walls of the uterus thickens in preparation for pregnancy.

TERMINOLOGY:

TERM: **Menstruation**	
DEFINITION: refers to the discharge of blood and other material from the lining of the uterus at intervals of about one month.	**USE IN SENTENCE:** During menstruation the unfertilized egg together with the thickened lining of the uterus is released.

FERTILIZATION AND EMBRYONIC DEVELOPMENT

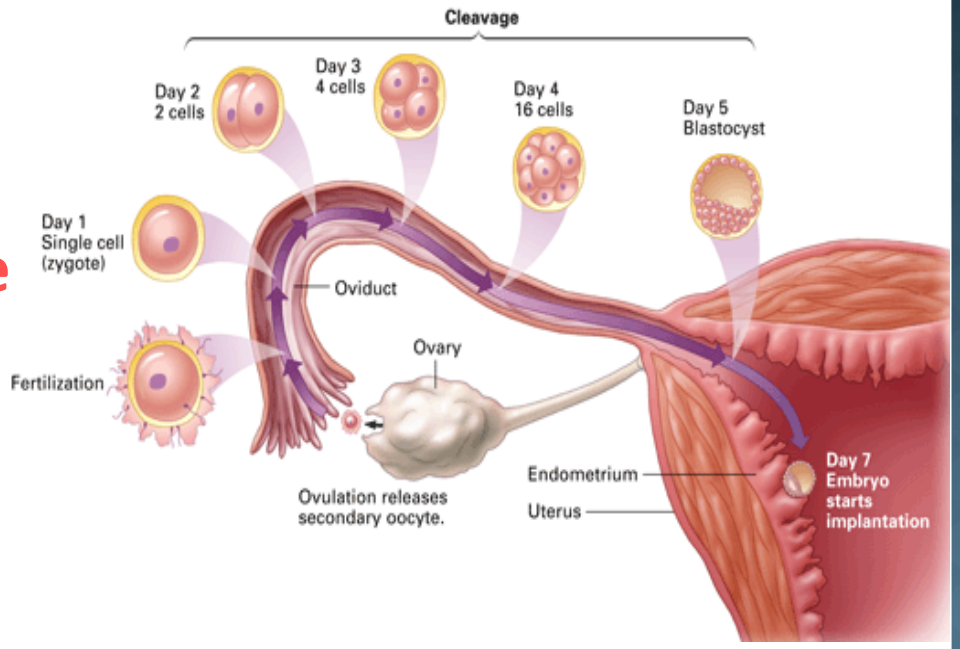
- **Sexual intercourse** is also known as **copulation**.
- **During copulation** the **sperms** are **deposited into the vagina**.
- The **spermatozoa swim** up the **uterus**, into the **fallopian tube**.



Development of fertilized egg

FERTILIZATION AND EMBRYONIC DEVELOPMENT

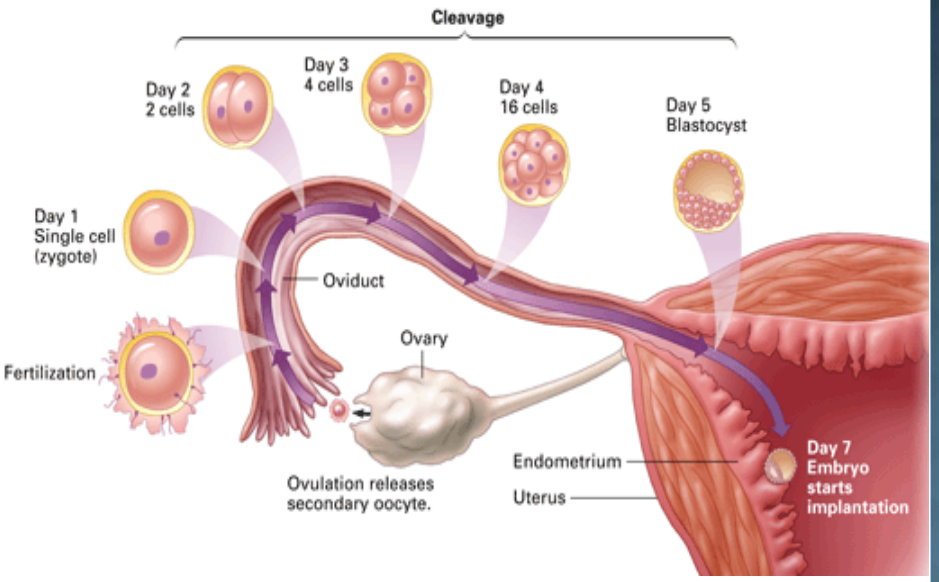
- If the **egg or ovum is present** in the **fallopian tube**, the **sperm will penetrate the egg**.
- This **process** is known as **fertilization**.
- **Fertilization** results in the **formation of a diploid zygote**.



Development of fertilized egg

FERTILIZATION AND EMBRYONIC DEVELOPMENT

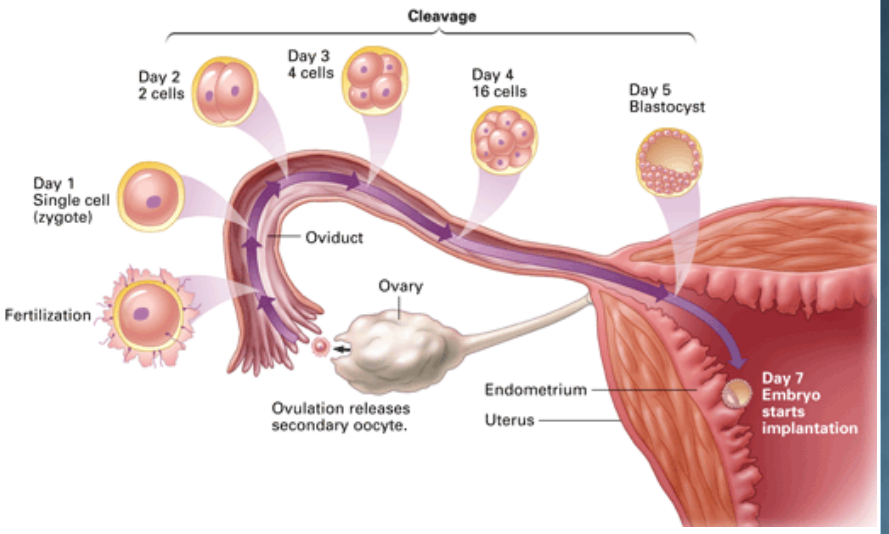
- The **zygote contains 46 chromosomes** with **genetic material from both the paternal and maternal parent**.
- This is because the **sperm is of paternal origin** and the **egg is of maternal origin**.
- The **zygote** then **divides by mitosis many times** as it **passes through the fallopian tube**.



Development of fertilized egg

IMPLANTATION AND DEVELOPMENT

- It eventually forms a **hollow ball of cells** called a **blastocyst**.
- The **blastocyst develops** into the **embryo** by the time it **reaches the uterus**.
- The **embryo** then becomes **attached to the wall of the uterus**.
- This process is called **implantation**.



Development of fertilized egg

IMPLANTATION AND DEVELOPMENT

- The **uterine wall** has to be **thickened, vascular and glandular** in order for **implantation to occur**.
- **Oestrogen** ensures that the **endometrium is thickened**.
- Since **fertilization has occurred**, the **corpus luteum secretes progesterone**.
- **Progesterone ensures that the pregnancy is maintained**, by **ensuring that the embryo remains attached to the uterine wall**.

TERMINOLOGY:

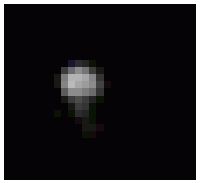
TERM: **Blastocyst**	
DEFINITION: Is a hollow ball of cells that is implanted in the uterus.	**USE IN SENTENCE:** The blastocyst becomes implanted into the uterine wall during implantation.

GESTATION:

- **Pregnancy** is also called the **gestation period**.
- They both may be defined as a **period** during which the **embryo develops within** the **uterus until the baby is born**.

Now lets look at the development of the embryo.

1. **14 Days after Fertilization**



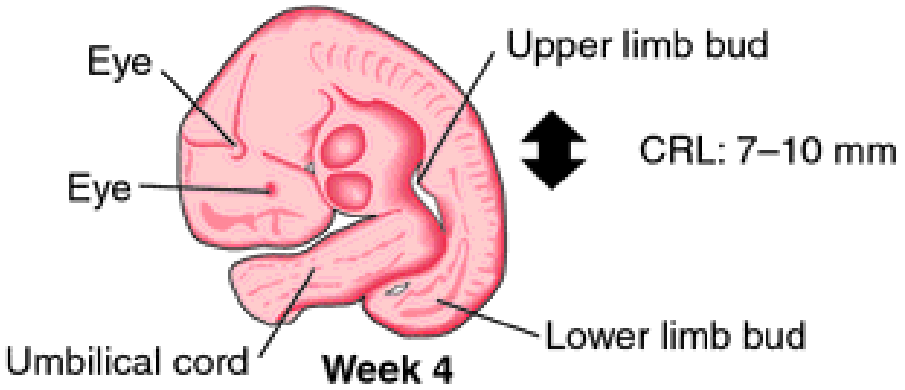
Embryo at 14 days

- The **embryo** still **looks like a big dot**.
- It is about **1 mm in diameter**.

GESTATION:

2. **4 weeks old…**

- The **embryo** is **comma-shaped**.
- It is about **5mm in diameter**.
- The **head, eyes and ears start to develop**.
- A **brain begins to develop** within the head.



Embryo at 4 weeks

GESTATION:

3. **12 weeks…**

- Now the **embryo resembles a human**.
- It is about **75mm in length**.
- It has a **mass of about 30g**.
- The **embryo at 12 weeks** is called a **foetus**.

Foetus at 12 weeks

TERMINOLOGY:

TERM: **Pregnancy or gestation period**	
DEFINITION: are both defined as a period during which the embryo develops within the uterus until the baby is born.	**USE IN SENTENCE:** Pregnancy of gestation in humans may last up to 9 months.

TERMINOLOGY:

TERM: **Foetus**	
DEFINITION: Name give to the embryo when it reaches 12 weeks.	**USE IN SENTENCE:** Once the embryo reaches 12 weeks, it is now called a foetus.

ROLE OF PLACENTA:

- Once **implantation occurs**, the **blastocyst develops 2 membranes around itself**.
- These **membranes are found around embryo**, therefore they are called the **extra-embryonic membranes**.
- The extra-embryonic membranes are …

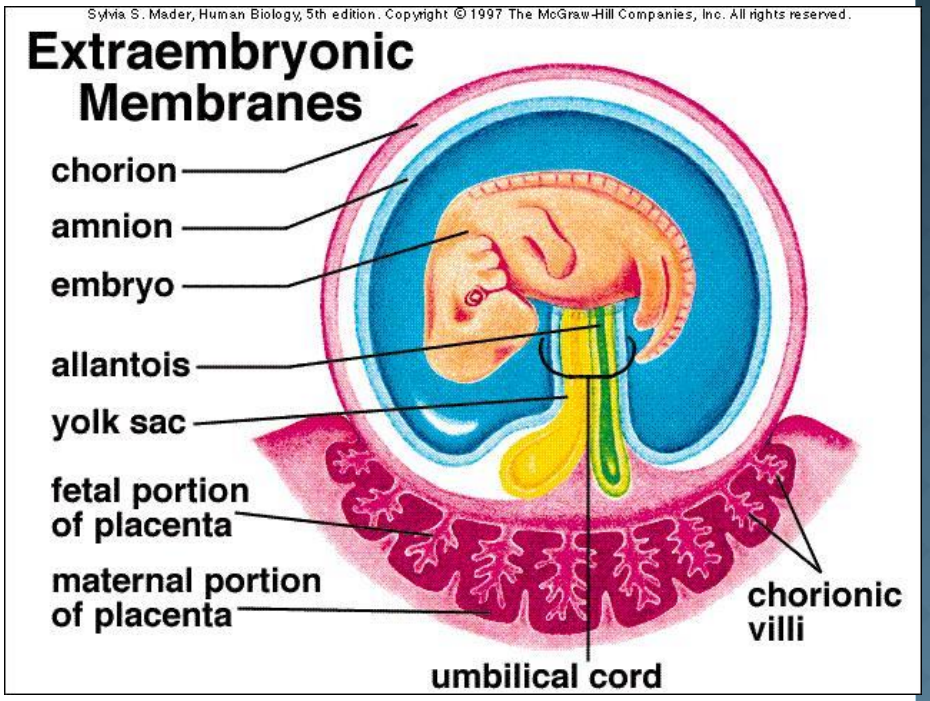
1. The Chorion and
2. The Amnion

Lets look at each of these membranes…

ROLE OF PLACENTA:

1. **The Chorion…**

- The **chorion** is the **outmost membrane.**
- It forms the **chorionic villi**.



2. **The Amnion…**

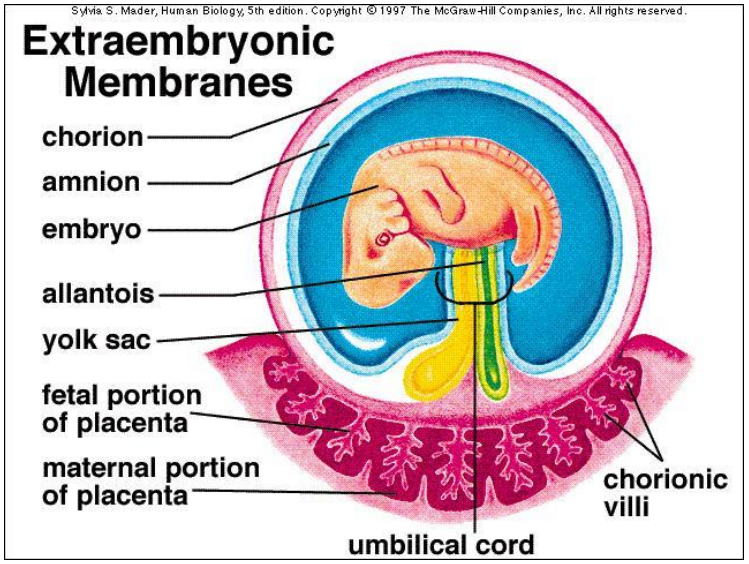
- It is **found** on the **inside of the chorion**.
- It forms a **cavity called the amniotic cavity**.

ROLE OF PLACENTA:

- The amniotic cavity is filled with a fluid.
- This fluid is called the amniotic fluid.

Lets look at the functions of the amniotic fluid…

1. It acts as a shock absorber, thus protecting the embryo from mechanical injury.

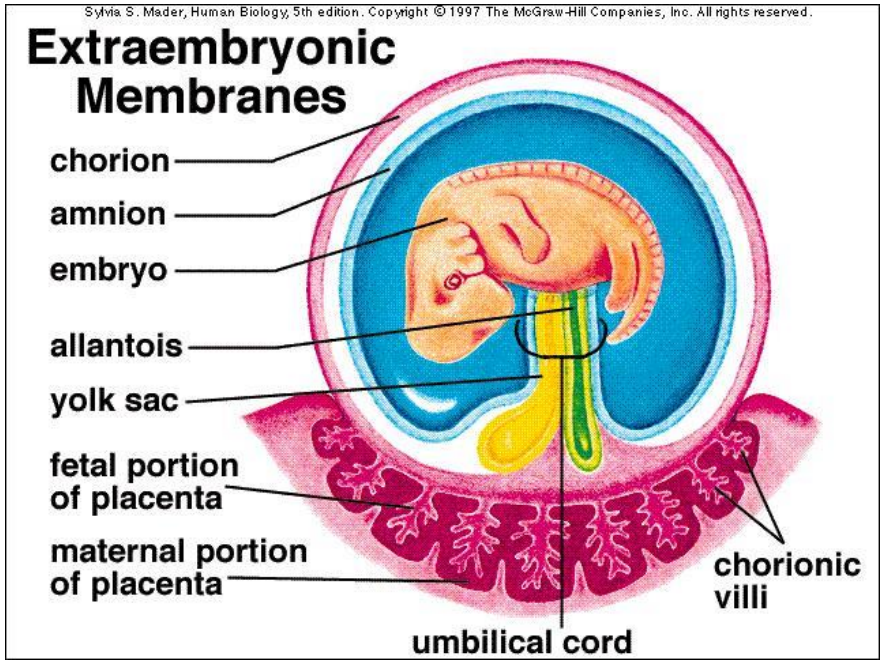


ROLE OF PLACENTA:

2. It **prevent the foetus from drying out**.
3. **Maintains a temperature range** with a very small change (small range)for the embryo.
4. **Allows for the free movement** of the foetus.

ROLE OF PLACENTA:

- The **placenta** is made up of the **chronic villi and the uterine tissue in which the villi are embedded**.



The functions of the placenta are as follows…

1. **Attaches** the foetus to mother.
2. Allows for the **diffusion** of dissolved food, as well as oxygen from mother to foetus.

ROLE OF PLACENTA:

3. It allows for the **diffusion of nitrogenous waste from the foetus to the mother**.
4. It also **allows for the diffusion of the carbon dioxide from the foetus to the mother**.
5. It **secretes its own progesterone** after 12 weeks of pregnancy.

- The **placenta is attached** to the **embryo by means of the umbilical cord**.
- The **umbilical cord is a hollow rope like tube**.
- The **umbilical blood vessels** are found within the umbilical cord.

ROLE OF PLACENTA:

- These blood vessels are the…

1. Umbilical artery
2. Umbilical veins

- The **umbilical artery** carries **deoxygenated blood with nitrogenous waste from the foetus to the placenta**, while the…
- **Umbilical vein** carries **blood rich in oxygen and food from the placenta to the foetus**.

ROLE OF PLACENTA:

- **Blood filled spaces** develop in the **placenta as the foetus develops**.
- These **blood filled spaces are called maternal sinuses**.
- The **chronic villi extend into these sinuses**.
- This means that the **chronic villi are bathe by the blood in the maternal sinuses**.
- Therefore the **blood of the mother and the foetus are in close contact with each other**.
- But the **blood is separated by the walls of the chronic villi**, therefore there is **no direct contact between the mother's blood and the foetus's blood**.

TERMINOLOGY:

TERM: **Chorion**	
DEFINITION: Refers to the outmost membrane around the embryo	**USE IN SENTENCE:** The chorion is one of the extra-embryonic membranes secreted by the embryo.

TERMINOLOGY:

TERM: **Amnion**	
DEFINITION: Refers to the membrane found on the inside of the chorion.	**USE IN SENTENCE:** The amnion is an example of another extra-embryonic membrane

CONTRACEPTIVES:

- **Contraceptives** are **used to prevent pregnancies**.

Lets look at some contraceptives.

1. **Condom**

- The condom acts as a **barrier**.
- It **prevents the sperms from getting into the vagina**.
- Not only does it **prevent unwanted pregnancies**, it also **provides protection against STDs**.

Condoms

CONTRACEPTIVES:

2. **Loop**

- This is also called an **IUD**.
- That it is an **intra uterine device**.
- It **functions** to **prevent the attachment of the egg or embryo to the uterine wall**.

Intra-uterine device

CONTRACEPTIVES:

3. **Female Condom**

- Like the male condom it **acts as a barrier**.
- It **prevents the sperms from entering the uterus or fallopian tube**.

Female Condom

CONTRACEPTIVES:

4. **Diaphragm**

- This **device covers the cervical opening**.
- Therefore it **acts as a barrier**.
- Therefore **prevents the sperm from entering the uterus**.

Diaphragm

CONTRACEPTIVES:

5. **Contraceptive Pill**

- It contains **synthetic hormones** .
- These hormones **prevents the production of the egg**.

Contraceptive Pills

CONTRACEPTIVES:

6. **Spermicides**

- These have a **chemical substance**.
- The chemical substance **kills the sperm**.
- It **prevents the sperm from entering the cervix**.
- Therefore it **acts as a barrier**.

Spermicides

CONTRACEPTIVES:

7. **Contraceptive Injections**

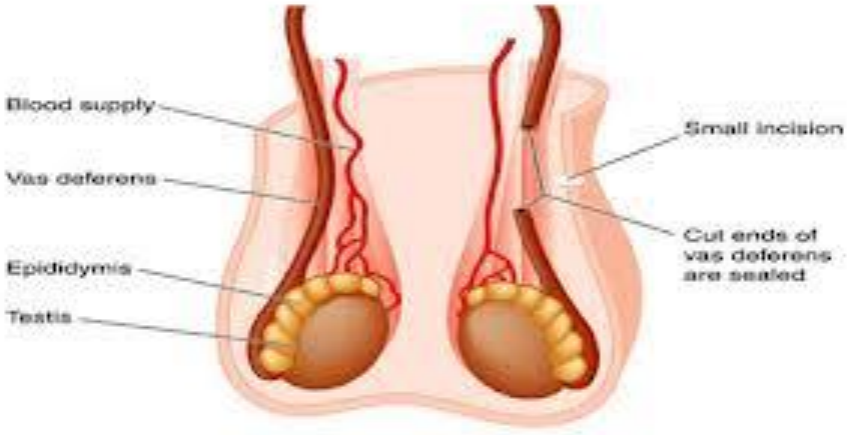
- They **contain hormones**.
- **Progesterone** or a **combination of oestrogen and progesterone**.
- It functions to **stop ovulation**.
- It works for **about 2 to 3 months**.

Contraceptive Injection

CONTRACEPTIVES:

8. **Male sterilization**

- This is also known as **vasectomy**.
- The **sperm ducts or vas deferens** are **cut and tied**.
- Therefore the **semen does not contain any sperm**.

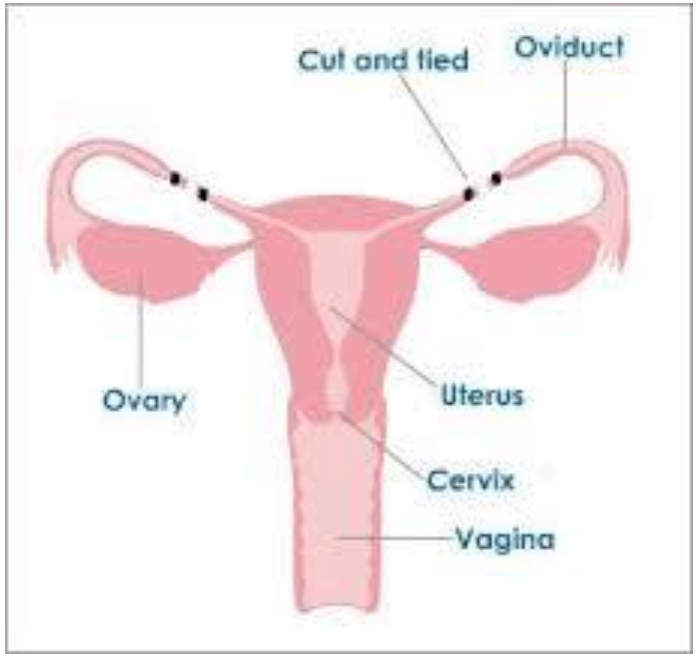


Vasectomy in Males

CONTRACEPTIVES:

9. **Female Sterilization**

- This is also **called tubal ligation**.
- This is a **surgical procedure**.
- The **fallopian tubes are cut and tied**.
- This **prevents fertilization of the egg**.



Tubal Ligation

CONTRACEPTIVES:

10. **Withdrawal**

- **This is not a reliable method of contraception!!!!**
- Here the **penis is withdrawn from the vagina before ejaculation**.
- This method is **most unreliable!!!!**

CONTRACEPTIVES:

11. **Rhythm**

- In this method the **menstrual cycle is used**.
- **Sexual intercourse is avoided** a **few days before and after ovulation**.
- Therefore **no sexual intercourse between days 10 to 18 of the menstrual cycle**.
- This is **not a reliable method** because **ovulation is not predictable**.

TERMINOLOGY:

TERM: **Contraceptives**	
DEFINITION: used to prevent pregnancies.	**USE IN SENTENCE:** The condom is an excellent form of contraception because it also provides protection against STDs.

TERMINOLOGY:

- **Sexual reproduction**: is reproduction that occurs with the use of gametes.
- **Puberty**: refers to the period during which sexual maturity occurs.
- **Gametogenesis**: refers to the process by which gametes are produced from the germinal epithelium of the male and female gonads or sex organs.
- **Spermatogenesis**: is process by which the spermatozoa are produced from the germinal epithelial of the testes.
- **Oogenesis**: is the process during which the eggs or ova are produced from the germinal epithelium of the ovary.

TERMINOLOGY:

- **Menstrual cycle**: refers the changes that occur in the ovary and uterus of a female over a period of 28 days.
- **Ovulation**: is the process during the mature egg is released from the Graafian follicle of an ovary.
- **Uterine cycle**: refers to the changes that occur in the walls of the uterus as it thickens until menstruation occurs.
- **Oestrogen**: secreted by the Graafian follicle and is responsible for thickening of the endometrium.
- **Endometrium**: lining of uterus.
- **Menstruation**: refers to the discharge of blood and other material from the lining of the uterus at intervals of about one month.

TERMINOLOGY:

- **Blastocyst**: is a hollow ball of cells that is implanted in the uterus.
- **Pregnancy or gestation period**: refers to a period during which the embryo develops within the uterus until the baby is born.
- **Foetus**: name give to the embryo when it reaches 12 weeks.
- **Chorion**: is the outmost membrane around the foetus.
- **Amnion**: refers to the membrane found on the inside of the chorion.
- **Contraceptives**: are used to prevent pregnancies.

QUESTION 1

1. Which one of the following represents the correct order of the parts through which spermatozoa pass?

   A. Testis → vas deferens → epididymis → ureter

   B. Vas deferens → seminal vesicles → ureter → urethra

   C. Testis → epididymis → vas deferens → urethra

   D. Vas deferens → prostate gland → urethra → ureter

QUESTION 2

2. During oogenesis 4 haploid cells are formed. How many of these haploid cells develop into an ovum/ova

   A. 4

   B. 2

   C. 3

   D. 1

QUESTION 3

3. The statement below refers to the action of different contraceptive methods.

   1. inhibits secretion of FSH
   2. Increases the level of hormone progesterone
   3. Stops the embryo from implanting in the uterus
   4. Stops ovulation by inhibiting the development of the follicle

   Which combination refers to the action of the oral contraceptive pill only…

A. 1, 2 and 3 only
B. 1, 2 and 4 only
C. 1, 2, 3 and 4
D. 2, 3 and 4 only

QUESTION 4

4. Process by which the germinal epithelium of the ovary produces the female gamete is…

   A. Gametogenesis

   B. Oogensis

   C. Spermatogenesis

   D. None of the above

QUESTION 5

5. Process during which gametes are produced by the germinal epithelium of the gonads.

   A. Gametogenesis

   B. Oogensis

   C. Spermatogenesis

   D. None of the above

QUESTION 6

6. The process during which the sperms are produced from the germinal epithelium of the testes is…

   A. Gametogenesis
   B. Oogensis
   C. Spermatogenesis
   D. None of the above

QUESTION 7

7. The cell stage that is implanted during implantation…

   A. 2 cell stage

   B. 4 cell stage

   C. 8 cell stage

   D. 16 cell stage

QUESTION 8

8. The process during which the glandular and vascular endometrium and unfertilized egg leaves the body is…

   A. Menstruation

   B. Ovulation

   C. Fertilization

   D. Both A and B

QUESTION 9

9. The process that would not occur when one of the gametes pass the fallopian tube is…

   A. Menstruation

   B. Ovulation

   C. Fertilization

   D. Both A and B

QUESTION 10

10. The release of the mature egg from the ovary is…
    A. Menstruation
    B. Ovulation
    C. Fertilization
    D. Both A and B

QUESTION 11

11. The menstrual cycle is made up of…
    A. Ovarian cycle only
    B. Uterine cycle only
    C. Both A and B
    D. None of the above

QUESTION 12

12. When the Graafian follicle is converted into the corpus luteum, the levels of…
    A. Progesterone and LH increase
    B. Progesterone and LH decrease
    C. Progesterone increases and LH decreases
    D. Progesterone decrease and LH increases

QUESTION 13

13. The hormone that triggers the formation of the egg during oogenesis is…

    A. LH

    B. FSH

    C. Progesterone

    D. Oestrogen

QUESTION 14

14. The hormone that is responsible for the secondary female characteristics is…

    A. LH

    B. Oestrogen

    C. Progesterone

    D. Both B and C

QUESTION 15

15. Specialized cells in the seminiferous tubules, that are rich in glycogen…

    A. Sertoli cells

    B. Cells of Leydig

    C. Interstitial cells

    D. Epithelial cells

QUESTION 16

16. Interstitial cells found between the seminiferous tubules that secrete the male hormone is…

    A. Sertoli cells

    B. Cells of Leydig

    C. Interstitial cells

    D. Epithelial cells

QUESTION 17

17. The layer of the uterus that leaves the body during menstruation is…

    A. Endometrium

    B. Cervix

    C. Fallopian tube

    D. egg

QUESTION 18

18. That gland that secretes both FSH and LH is…
    A. adrenal
    B. Thyroid
    C. Pituitary
    D. Pancreas

QUESTION 19

19. The hormone that maintains pregnancy is…

    A. LH

    B. FSH

    C. Oestrogen

    D. Progesterone

QUESTION 20

20. Blood vessel that carries deoxygenated blood away from foetus is…

    A. Umbilical artery

    B. Umbilical vein

    C. Both A and B

    D. None of the above

SOLUTION:

1. C
2. D
3. A
4. B
5. A
6. C
7. D
8. A
9. C
10. C
11. C
12. A
13. B
14. D
15. A
16. B
17. A
18. C
19. D
20. A