

## THE REPRODUCTIVE SYSTEM

### Human being reproduction

**Reproduction** is the process of producing a new life. Humans reproduce by **sexual reproduction** and the reproductive organs involved are called the **genital organs**. They consist of the primary reproductive organs, or **gonads** and a number of **additional organs**.

In both women and men, cells in the **gonads** also act as **endocrine glands**.

**Human reproduction** is **sexual**. There are two sexes: **male** and **female**, which produce different types of reproductive cells or **gametes**: the male gamete is called **spermatozoid**, and the female gamete is called the **ovule**.

**Human fertilization** is **internal**; it means that the ovule and the spermatozoid join together inside the female reproductive system.

The **development** of the new human being occurs also inside the female reproductive system, and the baby is born alive and completely formed, so we are **viviparous**.

People acquire the capacity to reproduce (sexual maturity) in the first phase of adolescence, called **puberty**.

#### Reproduction processes

Reproduction includes the following processes:

##### Gametes production

It is made in specialized organs, called **gonads**, of the reproductive system.

##### Fecundation

It consists of the **union** of both **gametes** inside the female reproductive system, forming the **zygote**.

##### Zygote development

It is made inside the female reproductive system. **Zygote** develops until forming an **embryo**, and this a **foetus**.

##### Childbirth

It is the **birth** of a totally formed baby.

##### Development

It is the **maturation** of the sexual organs of the child, and the **transformation** into an adult able to produce **gametes** and to reproduce.

### Sexual dimorphism

Men and women, apart from having different sexual organs, present a marked **sexual dimorphism**.

**Women** have got little body hair, usually do not present baldness, have got smaller muscle mass, wider hips, bulky breasts with mammary glands, and high-pitched voice.

**Men** have got more body hair, most of them lose hair on their heads, present more muscle mass, wide shoulder and narrow hips, and deep voice.

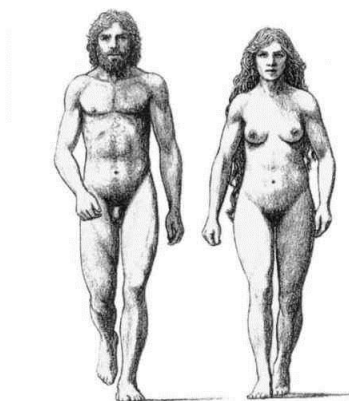
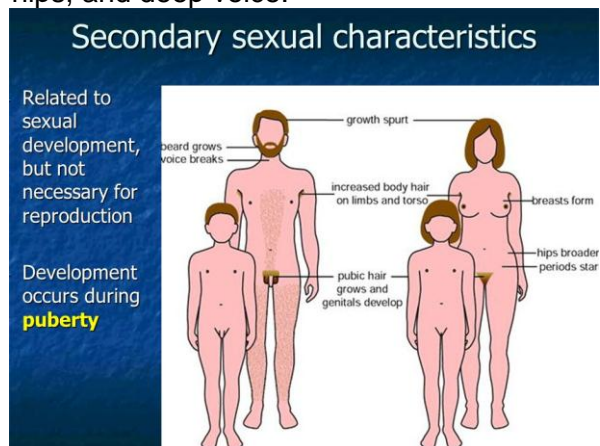


Figure 1.12 continued



### Changes in puberty

#### Childhood. The primary sexual characteristics

When a baby is born, his **reproductive system**, internal and external, is already formed. **Boys** have got **penis** and **scrotum**, and **girls** the **vulva**.

The presence of these reproductive organs matches to the **primary sexual characteristics**.

**Childhood** is a stage which lasts roughly from **birth** to the age of **ten**.

### **Puberty. The secondary sexual characteristics**

Between the ages of **ten** and **forty**, sexual organs mature. **Girls** have got the first **menstruation**, and **boys** start producing **spermatozoids**. This stage is called **puberty**.

The **sexual organs**, as they mature, produce **hormones** which provokes the appearance of the **secondary sexual characteristics**. They are external characteristics specific to each sex. The main ones are:

-**Boys** from **10** to **18** years old: The **skeletal muscles** develop; **body hair** appears; the **voice** becomes deeper; the **penis** and **testicle** increase in size and they start producing **spermatozoids**.

-**Girls** from **9** to **18** years old: The **hips** widen and the **waist** gets narrower; **hair** appears in the armpits and in the pubic area. **Breasts** develop and **menstruation** starts because the **ovules** start maturing in the **ovaries**.

### **The reproductive system**

The **male reproductive system** is made up of the penis, the testicles, the scrotum, the vas deferens and various glands.

The **female reproductive system** is made up of the ovaries, the uterus, the Fallopian tubes, the vagina and the vulva.

### **The male reproductive system**

#### **The testicles or testes**

The **testicles** are the two **male gonads**. They contain tubelike canals called **seminiferous tubules**, inside which the male gametes, called **spermatozoids**, are made after puberty.

The **testicles** are located in a sac called **scrotum** which hangs below the abdomen because the temperature for **spermatozoid** production must be slightly **lower** than body temperature.

The **testicles** also produce a hormone, called **testosterone**, after puberty.

#### **Spermatozoids and their formation**

**Spermatozoids** are constantly made in the **seminiferous tubules**. From there, they travel along **several days**, until getting the **epididymis**. In this period of time, they complete their **maturation** and develop a long **flagellum** with which they move faster.

**Spermatozoids** are much smaller and more **numerous** than **ovules**. **Hundred millions** spermatozoids mature in testicles every day. Their release is called **ejaculation**, in which **semen** is expelled, a liquid made up of **spermatozoids**, and **prostatic** and **seminal** liquids.

When **spermatozoids** are placed inside **vagina**, they stay **alive** between **three** and **five** days. In this time **reproduction** can take place.

**Spermatozoids** or **male gametes** are small, mobile cells. In them, we can differentiate:

#### **-The head**

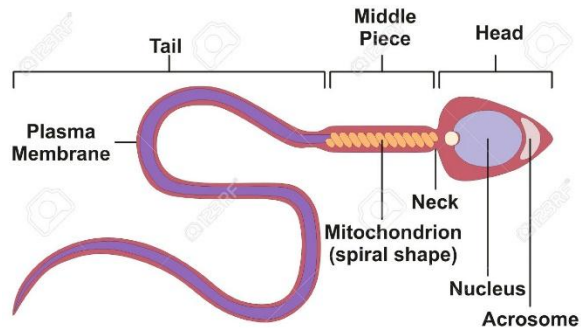
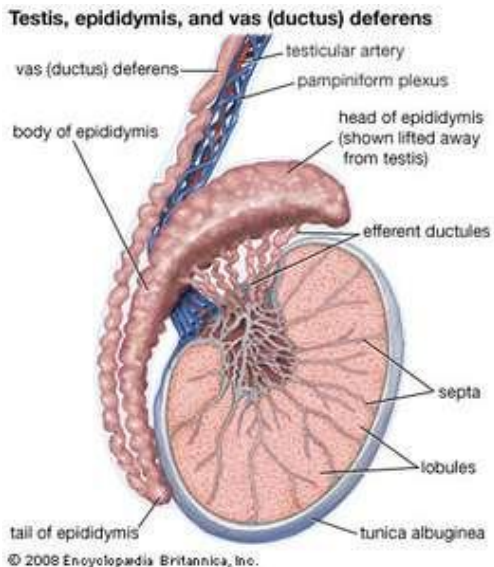
It contains the cell **nucleus**.

#### **-The intermediate part**

Its abundant **mitochondria** produce the energy necessary for movement.

#### **-The tail**

It has got a **flagellum**.



## The epididymis

The **epididymis** is a **whitish** mass of tightly **convoluted** small tubes cupped against the **testicles**.

The **epididymis** acts as a **maturation** and **storage** for **spermatozooids** before they pass into the **vas deferens**.

## Vas deferens or Sperm duct

The **vas deferens** is the continuation of the **epididymis**, a tube connected to each **testicle** and to the **urethra** which carries **spermatozooids** during **ejaculation**.

After being joined by the duct of the **seminal vesicles**, the **vas deferens** becomes the **ejaculatory duct** which enters the **prostate** to carry the spermatozooids contained in **semen** to the penis.

## Seminal vesicles

**Seminal vesicles** are sac-like structures attached to the **vas deferens** at one side of the **bladder**.

They produce the **seminal fluid**, a **sticky, yellowish** fluid that contains **fructose**. This fluid provides **spermatozooids** energy and aids in their mobility. **70%** of the **semen** is its secretion.

## Prostate gland

The **prostate gland** is a nut-sized gland, which surrounds the **ejaculatory ducts** at the base of the **male urethra**, just below the **bladder**.

The **prostate gland** is responsible for the production of **semen**, a liquid mixture of **spermatozooids**, **prostate fluid** and **seminal fluid**.

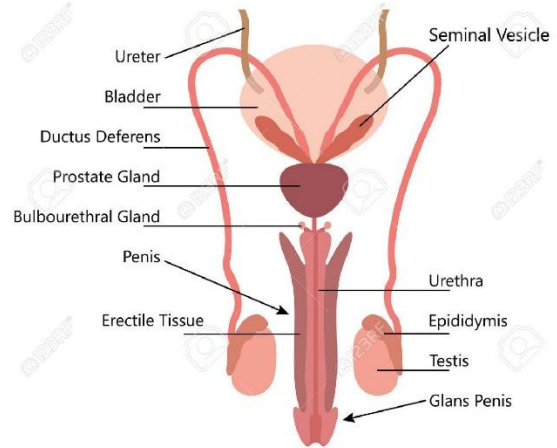
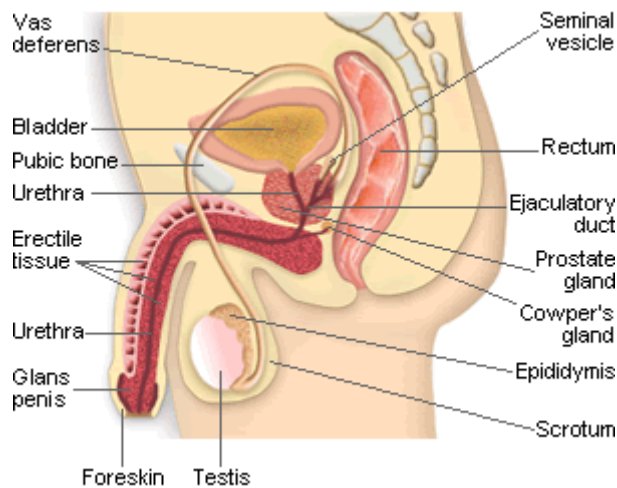
The **prostate gland** is also responsible for making the semen **milky** in appearance by mixing **calcium** to the **semen** coming from **seminal vesicles**. This liquid protects **spermatozooids** from the **acidity** of **urethra** and **vagina**.

## Penis

The **penis** is a cylindrical organ through which the **sperm** is ejected via the **urethra** during the copulation. Its end, called the **glans**, is widen and covered by the **prepuce**, a skin fold which can retract.

The **penis** is made of soft, sponge-like, **erectile tissue**, which has got many **spaces** called **blood sinuses**, **blood vessels** and nerve fibre endings or **receptors**.

When a man is sexually excited the **blood vessels** expand and the **sinuses** and blood vessels fill with **blood**. This makes the **penis** stiff and erect.



## Urethra

It is a **duct** which connects to the outside. Its **muscular walls** contract rhythmically during **ejaculation**, propelling **spermatozooids**.

## Scrotum

It is a **bag** made up of **skin** and membranes which cover the **testis** and lodge them outside the abdomen. This skin has got a lot of **sebaceous glands**.

## The female reproductive system

The **female reproductive organs** lie in the **lower abdomen** where they are protected by the **bony pelvis**.

### The Ovaries

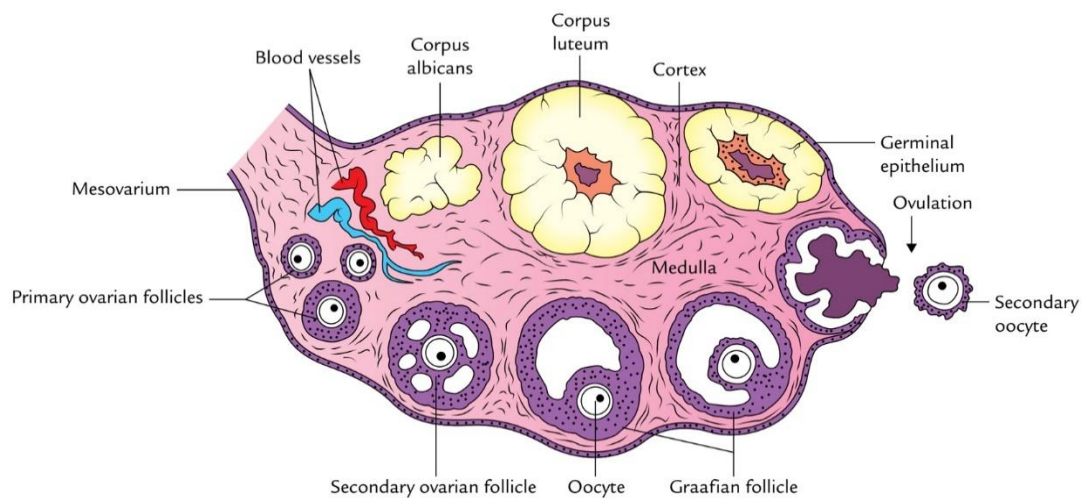
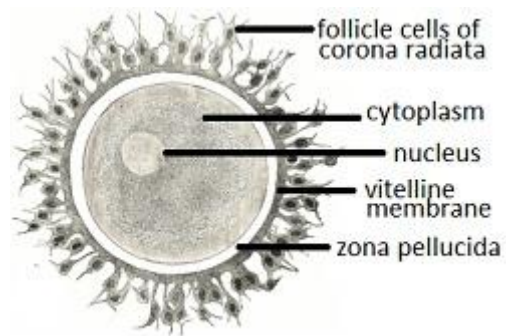
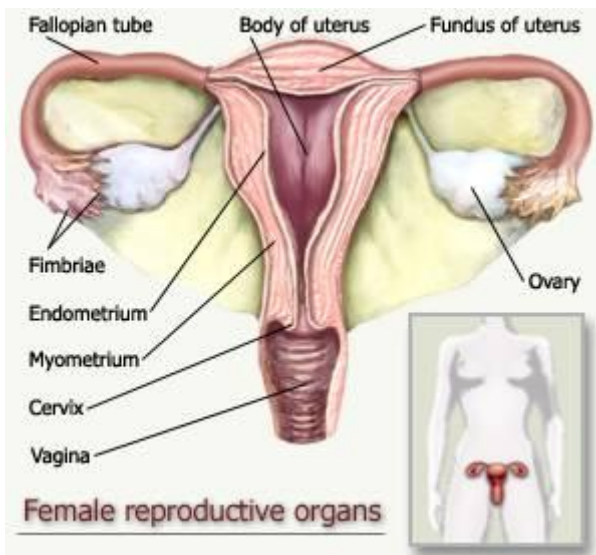
The **ovaries** are the two female, almond-shaped, **gonads**. The **ovaries** are held in place in the **lower abdomen**, below the kidneys, by **ligaments**.

The **ligaments** attach the **ovaries** to the walls of the uterus. The **female gametes**, called **ovules** are produced regularly in the **ovarian follicles** of the **ovaries**.

### The Ovarian follicles

The **Ovarian follicles** are areas of **tissue** appearing regularly in the **ovaries** after puberty. Each contains a maturing **ovule**. The **Ovarian follicles** gradually get larger and begin to secrete **hormones** such as **estrogen**.

Each round of **follicle** production results in only one fully mature **follicle** called **Graafian follicle**.



## Ovules and oogenesis

The **ovules**, or **female gametes**, are large, **spherical**, immobile cells. In them, we can differentiate:

- The **nucleus**, which contains **genetic material**.
- The **cytoplasm**, which contains **food reserves**.
- Three **membranes**.

The **oogenesis** is the formation of the **ovules**. It occurs in the **ovaries** in two steps:

1. **First step**. When the female is still an **embryo** and inside her mother's womb, **ovules** are formed in her **ovaries**, which are surrounded by cells and their development begins when the girl reaches **puberty**.
2. **Second step**. From **puberty**, approximately every **28 days**, an immature **ovule** matures and leaves the **ovary**; this process is called **ovulation**.

**Ovulation** is repeated until the woman reaches **menopause**, which marks the **end** of her ability to reproduce.

When a **girl** is born, in her **ovaries** there are about **400 000** cells which one day start to mature one by one, becoming **ovules**. Only **450** will mature during their **fertile life**.

**Ovules** are big cells, about 1mm of diameter, which mature in the **Graafian follicle**, inside **ovary**. The **Graafian follicle** opens and releases the **ovule** to the **Fallopian tubes**. It is surrounded by a **mass** of smaller **cells**, which forms a **protection wrapping**. From the moment it is expelled, the **ovule** stays **fertile** for **24 hours**. If in this time it is not fertilised, it will die.

## Fallopian tubes

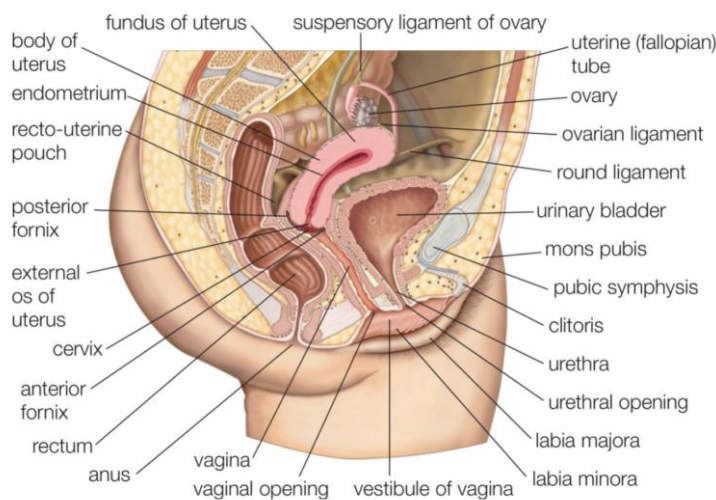
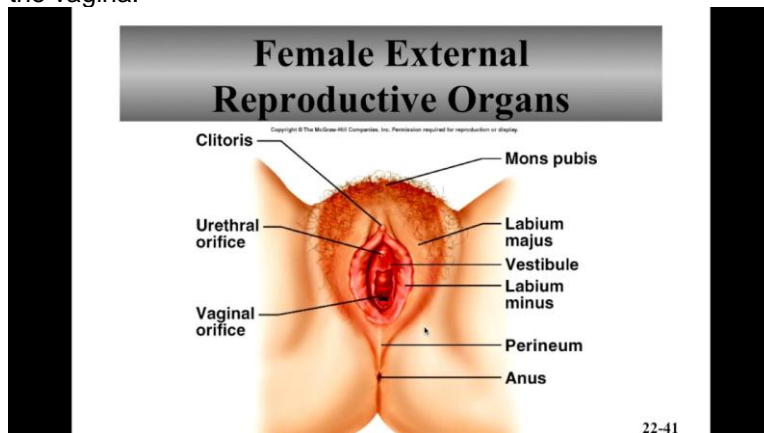
The **Fallopian tubes** are **two tubes** which connect the **ovaries** to the **uterus** after ovulation. Each **Fallopian tube** is approximately **four inches** (10cm) **long** and is lined with **ciliated cells**, which push the ovule to the uterus.

At the beginning of the **Fallopian tubes** has got a **funnelshaped** opening with **fringes**.

## Uterus or womb

The **uterus** is a hollow, **three-inch** long (8cm), **pear-shaped** organ with walls made of muscle, inside which a developing **foetus** is held, or from which the **ovules** are discharged.

The **uterus** has got a lining or inner wall of **mucous membrane** called the **endometrium**, covering a muscular wall with many blood vessels. The **endometrium** is shed and built up again each month, and it is where the **fertilized ovum** implants and grows during pregnancy. The neck of the womb, or **cervix**, joins the uterus with the vagina.



## The Vagina

The **vagina** is a **muscular canal**, **four-inch** long (10cm), that goes from the **uterus** to the external genitalia or **vulva**. The **vagina** has the ability to elongate during sexual intercourse to accommodate a penis.

The **vagina** carries away the **ovules** and **endometrium** during **menstruation**, receives the **penis** during **copulation** and serves as the **birth canal**.

Its **lining** produces a **lubricating fluid** which eases sexual intercourse.

## The Vulva

The **vulva** is a collective term for the **outer parts** of the **female reproductive system**; the **labia** and the **clitoris**.

-The **labia majora** and **minora** are two folds of skin, one inside the other, which surround the openings from the **vagina** and the **urethra**.

-The **clitoris** is the most sensitive part. Like the penis, it is made of **erectile tissue** and has got many **receptors**.

The **female urinary system**, unlike that of the male, is **separated** from the reproductive system. The **bladder** empties into the **urethra** which opens just in front of the vagina.

## The ovarian and reproductive cycles

A series of changes take place in the **ovary** and **uterus lining** or **endometrium** during the **28 days** of **ovule maturation**, these are known as the **ovarian cycle** and the **uterine cycle**

### The ovarian cycle and ovulation

The **ovarian cycle** lasts around **28 days**. It consists of **two** stages:

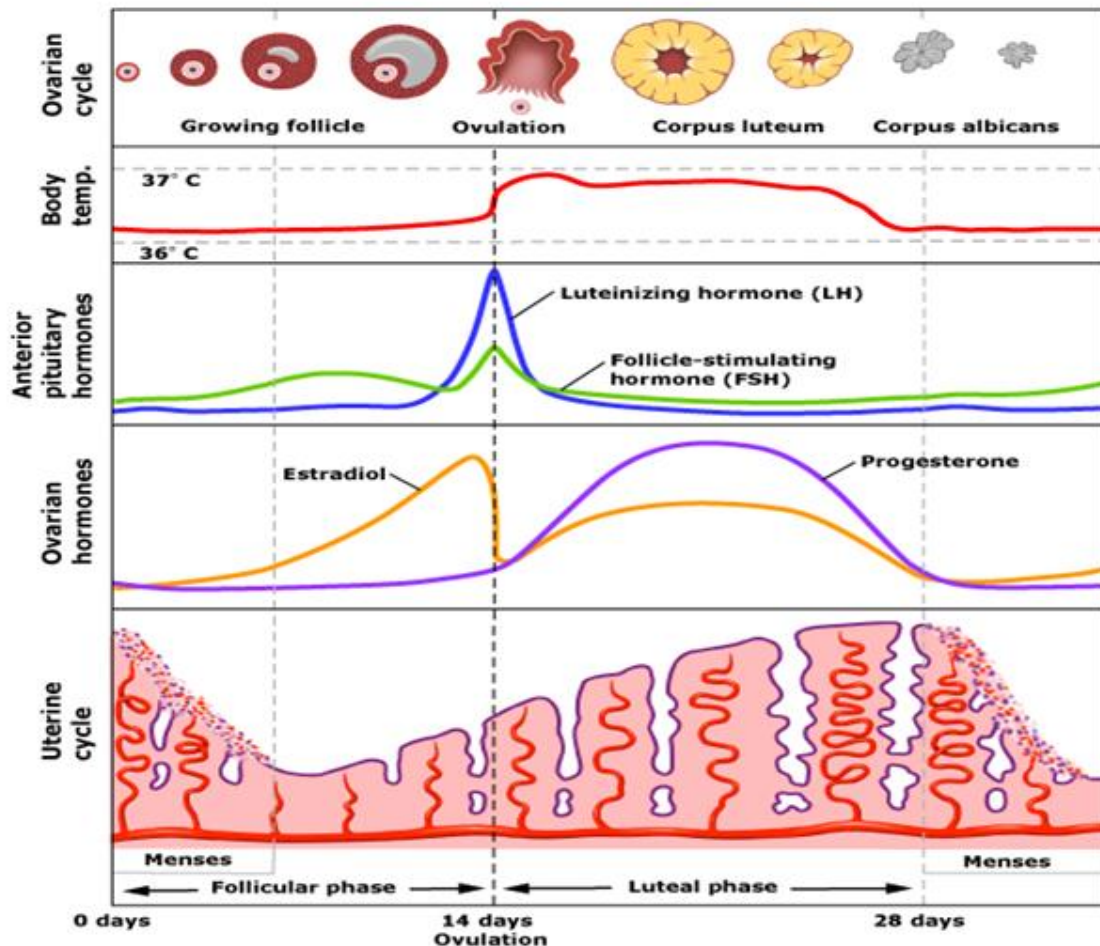
- 1 The **maturation** of the **ovule**, and **ovulation** or release of the **ovule** into the **Fallopian tube** so it can be fertilized. From about **day 5**, **Follicle-Stimulating Hormone** or **FSH**, promotes the growth of a **follicle** in the ovary. **Follicular cells** produce **estrogen** which builds up the endometrium, so it is ready for implantation of the fertilized **ovule**. In **midcycle** a surge of **Luteinizing Hormone** or **LH**, causes **ovulation**.

2 **After ovulation**, the cells that surrounded the **ovule** are transformed into a mass of yellow cells, called the **Corpus Luteum**, which secretes **Progesterone** which reinforces **Estrogen** and builds up the **endometrium** to its maximum thickness.

Then two things can happen:

A) If **fertilization** does not take place, this mass of cells, the **Corpus Luteum**, degenerates in the last few days of the cycle. The **lining** is shed during **menstruation** which marks the start of a new cycle.

B) If **fertilization** occurs, about day 14, the **fertilized ovule** secretes **Human Chorionic Gonadotropin** or **HCG**. This maintains the **Corpus Luteum** and its output of **Progesterone** and **Estrogen** so that the endometrium is maintained during pregnancy, and menstruation does not occur. The **endometrium** then nourishes the **fertilized ovule**.



## The uterine cycle and menstruation

The **uterine cycle** lasts around **28 days** and it is the transformation of the internal wall of this organ, called the **endometrium**, along with the process of maturation of the **ovule**. It consists of **three** phases:

1. The **endometrium**, which is very thick and vascularised, **detaches** and is **expelled** through the vagina together with the blood in its capillaries. These **haemorrhages** are known as **menstruation**.
2. The **endometrium** lost in menstruation regenerates itself.
3. The **endometrium** becomes **thicker** and **vascularises**, so that, if the ovum is fertilized, the **embryo** can develop. If fertilization does not take place, a new cycle begins and the **endometrium** is expelled through **menstruation**.

## Pregnancy and childbirth

The **ovulation** takes place about **fourteen** days before the coming of the **menstruation**. The ovule, released from the **Graafian follicle** is propelled, along the **Fallopian tube**, to the **uterus**. It lasts about a **week** in completing this way. The **ovule** can only be fertilized through **24 hours** from **ovulation**, when it is located in the **first third** of the **Fallopian tube**. In human reproduction there are four processes: **copulation**, **fertilization**, **pregnancy**, and **childbirth**.

## Copulation

**Copulation** is also called **coitus** or **sexual intercourse**. It is the insertion of the penis inside the vagina, followed by rhythmic movements of the pelvis in one or both sexes. Its culmination in males is **ejaculation**, the ejection of **semen** from the urethra, in the penis, into the vagina. **Semen** consists of **spermatozooids** and a fluid mixture or **seminal fluid**.

**Spermatozooids** are faster than **ovule**. They run the **vagina**, pass through the **uterus neck**, go through the inside of the **uterus**, and reach both **Fallopian tubes**, in **few hours**. Besides, they can be alive inside the uterus between **three** and **five days**, and for this reason, if the sexual intercourse is made in the days prior to menstruation, the probability of pregnancy is very high.

## Fertilization

**Fertilization** is the union of a **spermatozoid** and an **ovule** which produces a **zygote**. This process occurs after ejaculation.

Between **100** and **400 million spermatozooids** are deposited in a woman's **vagina** during the **sexual intercourse**. They swim in the uterus until they meet an **ovule** in the **Fallopian tubes**. Only **one spermatozoid** will penetrate the ovule's outer membrane called **zona pellucida**, and then through the **cell membrane** of the ovule. Then, the spermatozoid gives the flagellum away.

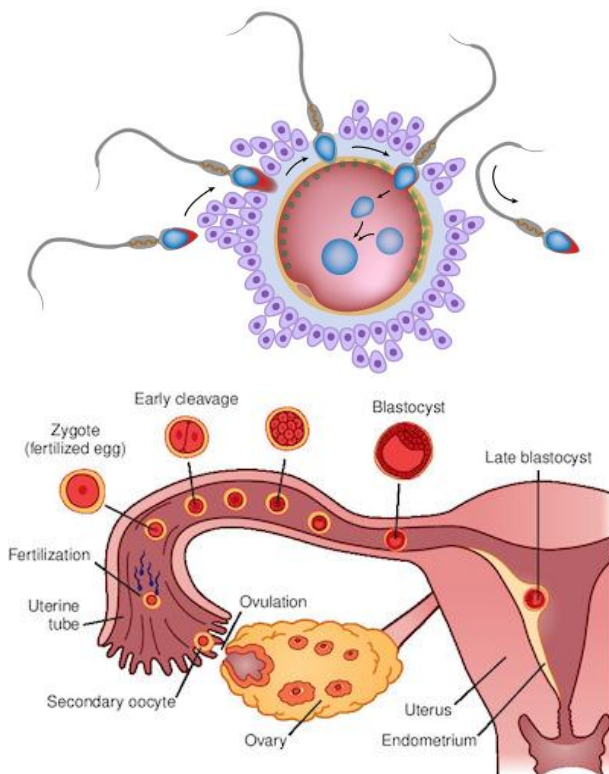
**Spermatozoid's nucleus** fuses with the **ovule's nucleus** and the first cell of a new human being is formed; the **zygote**.

The **23** single **chromosomes** in one **gamete** all pair off with their appropriate "partner chromosomes" from the other **gamete** to form the full **23 pairs** again. The result of this is a **diploid zygote**.

When **zygote** is made, a substance is produced which prevents the decaying of the **Graafian follicle**. This fact maintains intact and functional the **endometrium**.

Due to the fact that the **endometrium** does not decay, **menstruation** does not take place. It is the first symptom of **pregnancy**. The **zygote** travels towards the **uterus**, causing many cell divisions. During the days when the ovule's travelling towards the uterus, a **hundreds** of cells are made which build a **hollow ball** of about half a centimetre of diameter.

This ball of cells formed from these divisions then becomes **embedded** in the **uterus wall** after which it is called an **embryo**. This process is called implantation. This is how **pregnancy** begins.



## Pregnancy

**Pregnancy**, or **gestation** is the period when the **zygote** becomes the **embryo**, and the embryo develops into a **foetus** inside the mother's uterus.



Three important structures are formed from this moment:

### The placenta

It is an organ built in the **endometrium**. The **embryo** is connected to this organ.

The **placenta** extracts **nutrients** and **oxygen** from the mother's blood. They reach the embryo through a duct called the **umbilical cord**.

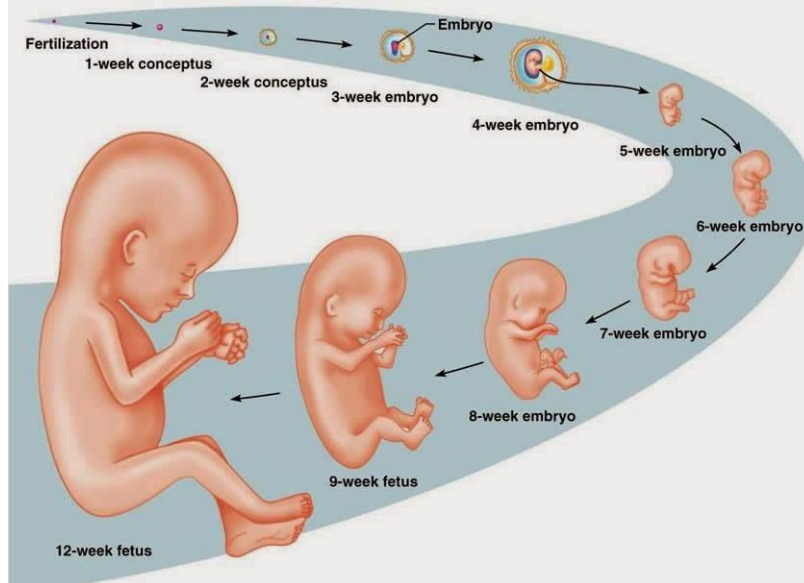
The **placenta** also produces **progesterone**.

### The umbilical cord

The **umbilical cord** attaches the **foetus** to the **placenta**. It is made up of a tube through which **three** blood vessels run; **two arteries** (the umbilical arteries) and **one vein** (the umbilical vein). The **umbilical vein** supplies the **foetus** with oxygen-rich, nutrient-rich blood from the **placenta**. Both **umbilical arteries** carry oxygen-poor blood, carbon dioxide and waste products back to the placenta, and then to the mother's vein.

### The amnion

It is a sac filled with a liquid, called **amniotic liquid**. The **embryo** is inside this liquid.

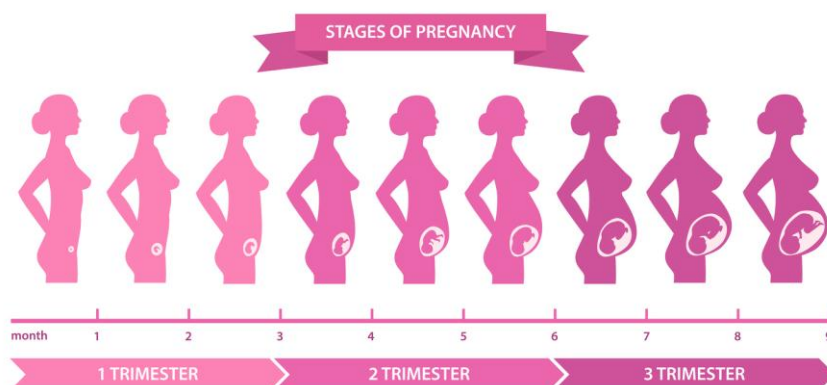


## Pregnancy development

**Pregnancy** lasts about **nine months**, forty weeks, which start to count from the beginning of the last **menstruation**.

Along the **pregnancy** the mother undergoes important changes due to the development and growing of the **foetus** inside her, to the exchange that she maintains with the **foetus** through the **placenta**, and that her body is preparing for labour and breastfeeding.

**Pregnancy** is divided into **three phases** of three months each: **first trimester**, **second trimester**, and **third trimester**.



### First trimester

During the **second week**, the **embryo** is surrounded and protected by the **amnion**, which is connected to the **placenta**. The head, trunk and limbs are forming, and also the internal organs, the circulatory, excretory and reproduction systems.

At **six weeks**, the heart beats. At the end of the first trimester, the embryo is **10cm tall** and its **weight** is between **50** and **80g**.

The mother has not got any **menstruation**, and can feel **physiological changes**, such as nausea, increase of the olfactory sense, and more appetite as the usual.

### Second trimester

From this period on the **embryo** is called a **foetus**. Its skeleton, musculature and all the organs develop. The nervous, circulatory and excretory systems mature. The **foetus' sex** can be recognized from the **4<sup>th</sup> month**.

At the end of second trimester the embryo is **30cm tall** and its **weight** is around **1kg**.

The **mother's uterus** dilates and her belly's perimeter increases. Her breasts' size increases and she can feel the movements of the **foetus** inside her.

### Third trimester

At the end of the **seventh month**, the **foetus' organs** are already sufficiently developed to survive outside the mother.

It moves so much, and is sometimes asleep and sometimes awake. From this moment until the ninth month the **foetus** gains weight and positions its head to fit in the **neck of the uterus**. At the end of the first trimester, the **embryo** is **50cm tall** and its **weight** is between **2.5** and **4kg**. Then it is ready to be born.

The **mother's uterus** is very bulky due to the big dilatation of the **uterus** in order to house the **foetus**. The **uterus** presses some internal organs, like the **bladder** or the **intestine**, which causes some discomfort.

### Childbirth

**Childbirth** is when the baby leaves the mother's body. When the baby is ready, the muscles of the wall of the **uterus** produce **contractions**, it is called **labour**. The **amnion** breaks and the **amniotic liquid** is poured through the vagina to the outside; it is called the **broken of waters**. It consists on three phases:

#### Dilation

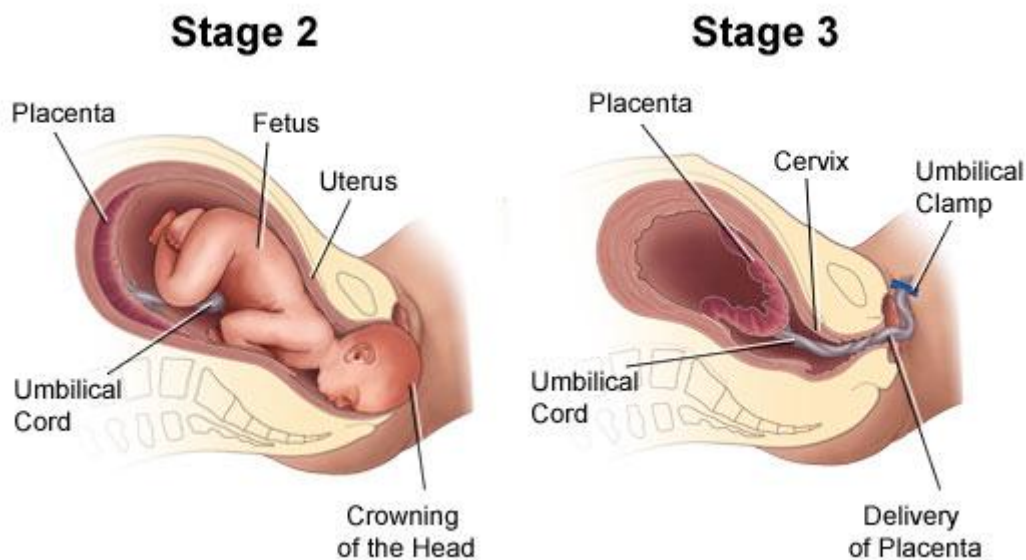
The **uterus contractions** push the baby's head into the **vagina** which stretches open to allow this.

#### Expulsion

The **baby's head** emerges, followed shortly by the rest of its body. Then, the **umbilical cord** is cut. The remains of the cord leave a **scar** on the abdomen of the baby; the **navel**.

#### Delivery of the placenta

Shortly after the birth (between five and fifteen minutes), the **placenta** and the remains of the **endometrium** are pushed out of the vagina.







## Reproduction and health

### Methods of contraception

**Methods of contraception** are the **mechanisms** used by human beings to avoid the development of the **embryo**.

There are different **methods of contraception**. It is important to choose the most suitable to each situation.

	Birth Control	How to Use	Prescription Needed	Protects Against STDs
<b>Hormonal</b>	Monthly oral contraceptive (the Pill) 	Take one pill every day as directed.	Yes	No
	Extended-regimen oral contraceptive 	Take one pill every day for three months as directed.	Yes	No
	Patch 	Apply to skin and change weekly.	Yes	No
	Vaginal ring (hormonal) 	Insert monthly and leave in place for 21 days.	Yes	No
	Injection 	Get injections every three months.	Yes, injections given in health care provider's office.	No
	Hormonal intrauterine contraceptive (IUC) 	Inserted in the uterus and can remain for up to three or five years.	Yes, IUC inserted in health care provider's office.	No
	Implantable hormonal contraceptive 	Implanted under the skin of the arm and can remain for up to three years.	Yes, implanted in health care provider's office.	No
<b>Non-hormonal</b>	Spermicide 	Apply every time before sex.	No	No
	Diaphragm 	Insert every time before sex. Keep in place for six hours after sex.	Yes	No
	Contraceptive sponge 	Insert vaginally. Effective for 24 hours. Keep in place for six hours after sex.	No	No
	Cervical cap 	Insert every time before sex and keep in place for six hours after sex.	Yes	No
	Female condom 	Insert every time before sex.	No	Yes
	Male condom 	Partner must wear every time during sex.	No	Yes (latex or synthetic only)
	Non-hormonal intrauterine contraceptive (IUC) 	Inserted in the uterus and can remain for up to 10 years.	Yes, IUC inserted in health care provider's office.	No
	Female sterilization or male sterilization (vasectomy) 	No action required after surgery.	No, performed surgically.	No

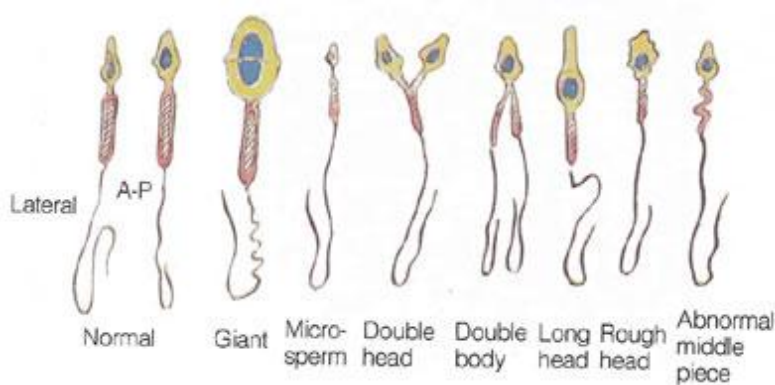
## Assisted reproduction

**Infertility** is the impossibility of having **offspring**. Its cause can be in man, in woman or in both.

The sterility causes can be the following:

### In man

- Production of **insufficient** number of **spermatozoids**.
- Production of **immature spermatozoids**, with lack of mobility or deformities, which cannot fertilize the ovule.
- Disorders which stop the pass of spermatozoids, such as the **vas deferent swelling**.



### In women

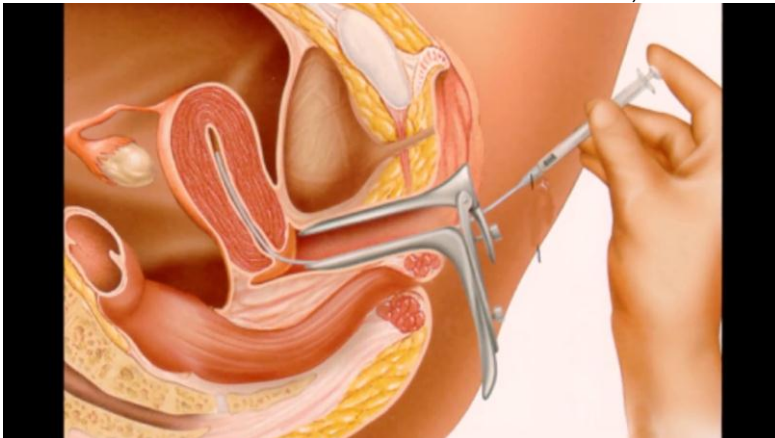
- **Obstruction** of the **Fallopian tubes**.
- **Lack of ovulation** caused by hormonal imbalance, by malnutrition or by other health problems.
- **Lack of implantation** of the zygote into the **endometrium**, so although fecundation is produced, **embryo** do not develop.

**Assisted reproduction** is the name given to a series of **artificial techniques** used to solve problems of **infertility** in couples.

The most used techniques are:

- **Artificial insemination (AI)**. Artificial insemination is the deliberate introduction of **donor semen** into a **female's vagina** or **oviduct** with the purpose of achieving a pregnancy through fertilization by means other than copulation.

It is the medical alternative to sexual intercourse, or natural insemination.

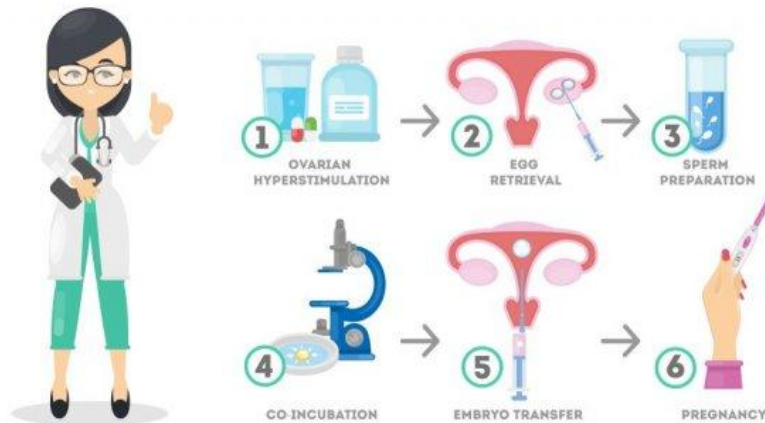


- **In vitro fertilization (IVF)**. It is a process by which an **ovum** is fertilized by **spermatozoids** outside the body: **in vitro**. **IVF** is a major treatment for **infertility** when other methods of assisted reproductive technology have failed.

The process involves **monitoring** and **stimulating** a woman's ovulatory process, removing **ovules** from the woman's ovaries and letting **spermatozoids** fertilize them in a fluid medium in a laboratory.

The fertilized ovule or **zygote** is cultured for **2–6 days** in a growth medium and is then transferred to the **mother's uterus** with the intention of establishing a successful **pregnancy**.

## IN VITRO FERTILIZATION



### Sexually-transmitted diseases

**Sexually-transmitted diseases (STDs)** are caused by **funguses, bacteria** or **viruses**. They are transmitted by **sexual contact**, and from mother to child through the **placenta** or during **birth**.

Due to the effects it causes, one of the most serious is **AIDS**.

### AIDS

**AIDS** is a disease caused by **HIV** (the human immunodeficiency virus). Its main symptom is the loss of **defences** against microorganisms, so the people who suffer from it are not protected and can suffer from many other diseases, called **opportunistic diseases**.

**HIV** is transmitted through the **blood, semen, vaginal secretions** or the **mother's milk**. People infected with the virus but who have not developed the disease are **seropositive** and can transmit it during **sexual relations** or through **blood transfusions**. There are now **treatments** that **alleviate** the symptoms of the disease, though none of them cure it.

### Taking care of the reproductive system

You must take care of the **daily hygiene** of the **external reproductive organs**, and go to the **doctor** if you think anything might be wrong with them.

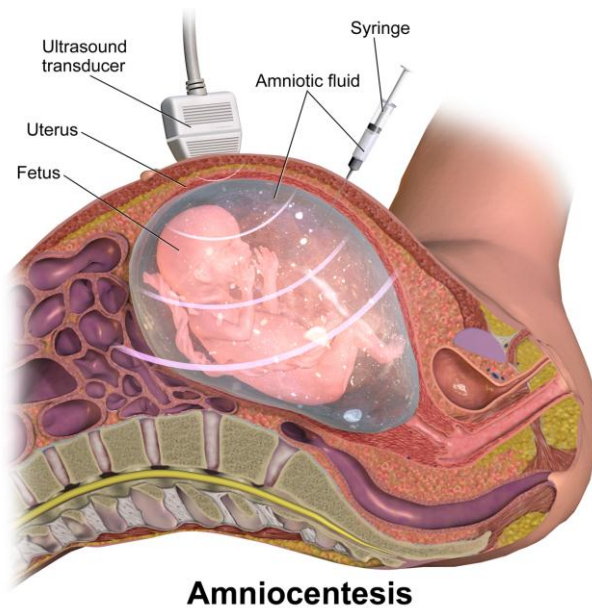
- **Pregnant women** must eat a **balanced diet**, and avoid alcohol and tobacco, to provide the proper development of the **foetus**.
- **Prophylactics or Condoms** should be used during **sexual relations** in order to prevent **STDs**. In regard to **AIDS**, utensils which could damage the skin or the tissues of the internal tracts should not be shared.

### Amniocentesis

Women who are going to be mothers should have regular medical **check-ups**. These check-ups consist of **ultrasound examination** and **blood and urine analyses**, to check the development of the pregnancy.

If the future mother is over the age of **thirty-five**, the **gynaecologist** might recommend an **amniocentesis**. **Amniocentesis** is a technique that is used to detect possible malformations, hereditary diseases or chromosomal abnormalities, such as **Down's syndrome**, in the **foetus**. It is done between the **15th** and **20th** week of gestation in the following way:

- **Step 1.** The **foetus**, the placenta and the amniotic sac are located by means of **ultrasound**.
- **Step 2.** The skin is cleaned with an antibacterial solution and the doctor, guided by the ultrasound, and plunges a **needle** into the **amniotic sac** to take a sample of the **liquid**, which contains **foetal cells**.
- **Step 3.** The liquid obtained and the **foetal cells** in it are separated by means of **centrifugation**.
- **Step 4.** The **cells** separated from the liquid are cultivated and analysed for possible **chromosomal abnormalities**.



### Activities

1. What are the primary sexual characteristics? When do they appear?
2. What are the secondary sexual characteristics? When do they appear?
3. Define puberty.
4. What are testicles? What do they produce?
5. What are ovaries? What do they produce?
6. How do ovules move along Fallopian tubes if they have not got structures for movement?
7. Define spermatogenesis, oogenesis and menopause.
8. Where are spermatozooids made? Which part do they complete their development in?
9. Do a drawing of the spermatozoid and the ovum and write the names of the parts of each one
10. Define endometrium and menstruation.
11. The degeneration of the endometrium is produced by a sudden change in the concentration of a hormone.  
What is this hormone? What is the gland which produces it? Why does the gland stop the hormone production suddenly?
12. If spermatozooids can stay alive about three days inside the female reproductive system, and the ovule stays alive and fertile 24 hours, what days have a high probability of pregnancy in sexual intercourse for a woman who ovulates the 24th day of a month?
13. What happens when the spermatozoid enters the ovule?
14. Define zygote, embryo and foetus.
15. Where in the female reproductive system does fertilisation take place? Explain the process.
16. What function do the placenta and umbilical cord have?
17. Describe the steps of childbirth.
18. Define methods of contraception, STD and AIDS.
19. Indicate how sexually-transmitted diseases can be prevented.
20. There are three methods usually called "barrier methods" because they consist of a physical barrier which prevents the access of spermatozooids to the uterus. What are they?
21. Not all pregnant women undergo an amniocentesis, because it has certain risks. What do you think these might be?
22. Above what age are pregnant women normally recommended to have an amniocentesis?
23. Make a list of the precautions a woman must take during her pregnancy