

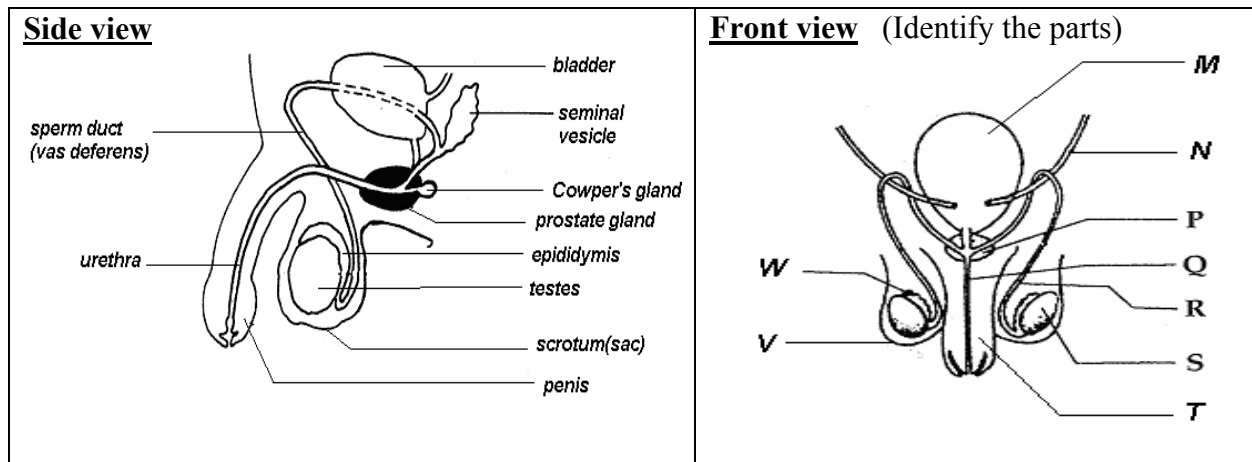
Biology Notes

Topic: Reproduction III – Reproduction in humans

Objectives: At the end of this topic, the students should be able to:

1. Describe the structure and the function of the male and female reproductive systems.
2. Describe the female menstrual cycle and the factors that affect it.
3. Describe the processes of gamete formation, sexual intercourse, fertilization and implantation as they relate to human reproduction.
4. Describe the development of the foetus.
5. State the functions of the amniotic sac and the amniotic fluid.
6. State the effects on the unborn foetus if the mother uses/abuses drugs.
7. Describe the process of birth.
8. State the advantages of breast milk compared with bottle-feeding.

The male reproductive system



Penis – the male sex organ; contains erectile tissues

Scrotum – bags or sacs containing the testes

The scrotum hangs from the body to keep it at a temperature lower than the body temperature. Sperms do not remain viable at body temperature.

Testes – produces sperms and hormones (testosterone)

Epididymis – coiled tubules which store sperm; the sperms in the epididymis are inactive and non-motile

Prostate gland – produces secretions which activate sperms i.e. make them motile

Cowper's gland – also produces secretions to activate the sperms

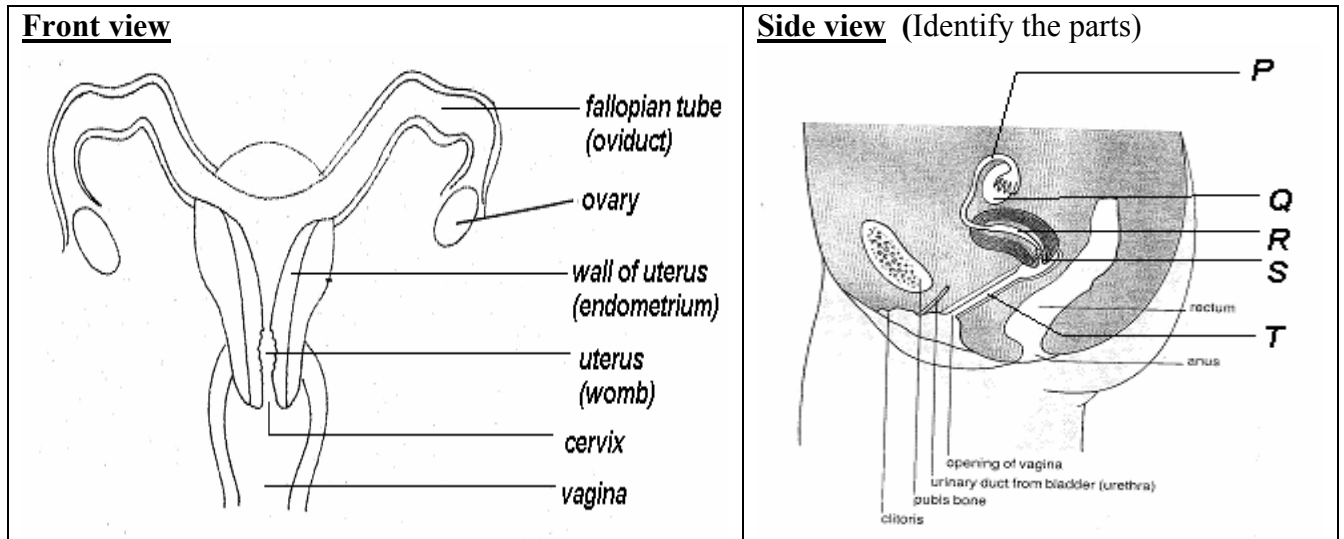
Seminal vesicle – produces seminal fluid which provides nutrition for the sperm cells as well as help to activate them

The secretions of the prostate gland, Cowper's gland and the seminal vesicle along with sperms make up semen.

Sperm duct – transports sperm from the epididymis to the ejaculation duct

Urethra – transports semen from the ejaculatory duct to the exterior

The female reproductive system



Vagina – female sex organ; receives the sperms and acts as the birth canal during birth

Cervix – the mouth or opening of the womb

Uterus – place where the foetus develops

Endometrium – inner wall of the uterus; this wall breaks down during menstruation

Ovary – produces the eggs (ova) and hormones (estrogen)

Fallopian tube – transports the egg to the uterus; fertilization normally takes place in the fallopian tube

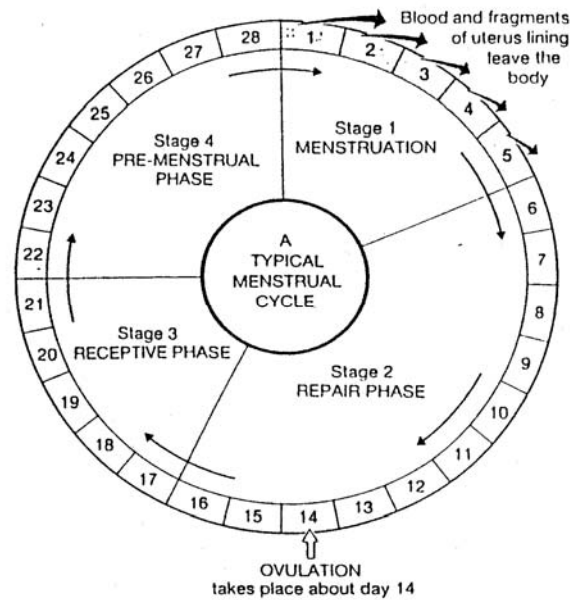
The female menstrual cycle

The menstrual cycle is a series of changes which occur in the female reproductive system. The cycle normally lasts about 28 days but may vary from person to person. The cycle begins with **menstruation** which is when the lining of the uterus breaks down and is shed from the body. This is commonly called the ‘period’. Menstruation normally lasts for about 5 days after which the lining begins to rebuild again. Also during this time an immature egg in the ovary begins to develop. This portion of the cycle lasts from the end of menstruation (day 5) to about the middle of the cycle (day 14). By this time the lining would have been fully rebuilt and the mature egg is now released into the fallopian tube from the ovary. (**ovulation**)

The egg must be fertilized within the first 24 – 48 hours after it is released for it to remain viable. In the meantime the uterus continues to develop and thicken producing numerous blood vessels in preparation for implantation. This process is promoted by a hormone called **progesterone**. If the egg is not fertilized however, it is broken down and its contents reabsorbed by the body. The level of progesterone in the body begins to decrease. After about two weeks (day 14 -28), the lining begins to break down again and the cycle repeats itself. The breakdown is due primarily to the decreased level of progesterone in the body

The menstrual cycle is affected by several factors including emotional state and diet. It also ceases whenever one gets pregnant.

THE MENSTRUAL CYCLE



A typical menstrual cycle. It is usual to regard the first day of the cycle as the day when bleeding begins.

Gamete formation

Sperms are made in the **testes** at a rate of about 1 million per second. A normal ejaculation contains approximately 300 million sperm cells. However, only one is needed for fertilization. Many sperm cells die on their way to the fallopian tube.

Egg cells are made in the **ovaries** at a rate of one per month. A female may produce up to 400 eggs in her entire life time.

Collectively eggs and sperms are known as **gametes** and the ovaries and testes are called **gonads**.

If left on their own, eggs and sperms simply die.

Sexual intercourse and fertilization

Eggs and sperms normally meet during sexual intercourse. During this process, **ejaculation** occurs and the sperms are deposited into the female vagina. They swim their way to the **fallopian tube** where they meet the egg. The first sperm to bump into the egg penetrates it and the **nuclei** of the sperm and the egg join together. This is called **fertilization** and the fertilized egg is called **zygote**. The zygote then goes through a series of cell division to form a ball of cells called the **embryo**.

Implantation and development of the foetus

Implantation is the attachment of the embryo to the wall of the uterus. This occurs about 3-5 days after fertilization. Implantation marks the beginning of pregnancy.

Fig. 14.41 Fertilization and the development of the foetus in mammals

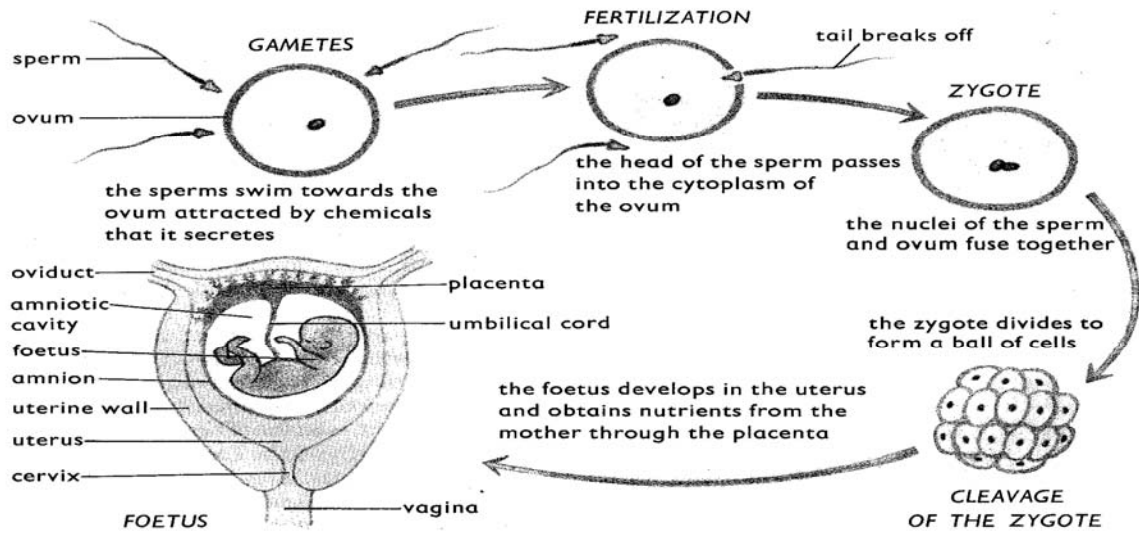
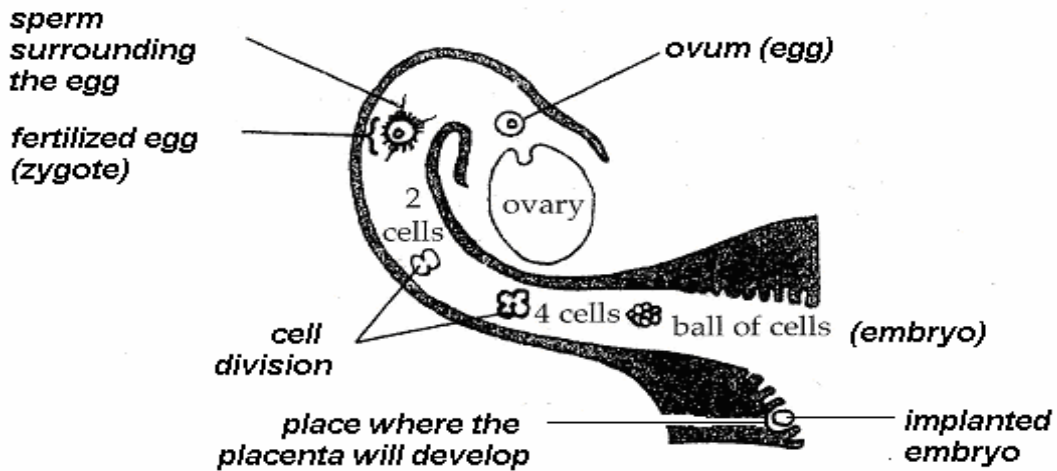
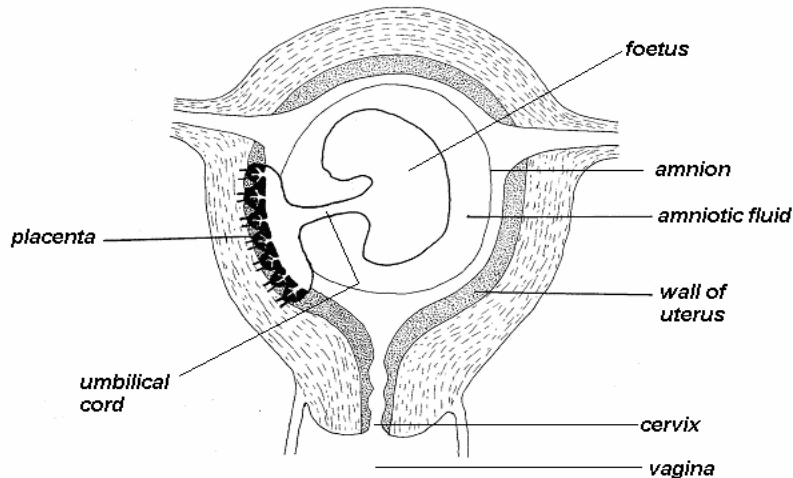


Diagram showing ovulation to implantation



Development of the foetus

Following implantation, the embryo begins to develop several extra-embryonic membranes. These give rise to the **amnion (amniotic sac)** within which is the **amniotic fluid**, the **placenta** which supplies the foetus with all that it needs (i.e. food and oxygen) and the **umbilical cord** which connects the foetus to the placenta. The placenta is the link between the foetus and the mother. The amniotic fluid provides a liquid medium in which the foetus is suspended and it acts as a shock absorber, cushioning and protecting the foetus as the mother moves.

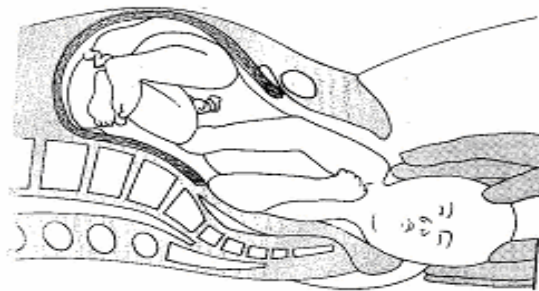


The effects of drug abuse by pregnant women

All kinds of drugs should be avoided during pregnancy because of the potential harmful effects it may have on the unborn foetus. These effects include low birth weight, deformities, mental retardation and other organic dysfunction. Drugs are able to cross the placental barrier from the mother into the foetus.

Birth of the foetus

The time between conception and birth is called the gestation period. It is approximately 9 months in humans. At the end of the gestation period, the uterus begins to undergo occasional contractions which become steadily more frequent and powerful. This is called **labour**. At about this time the amniotic sac (water bag) bursts and the amniotic fluid escapes through the vagina (breaking of the waters). Soon afterwards the uterus starts contracting powerfully and the cervix dilates (opens). As a result the foetus is pushed through the vagina, usually head first.



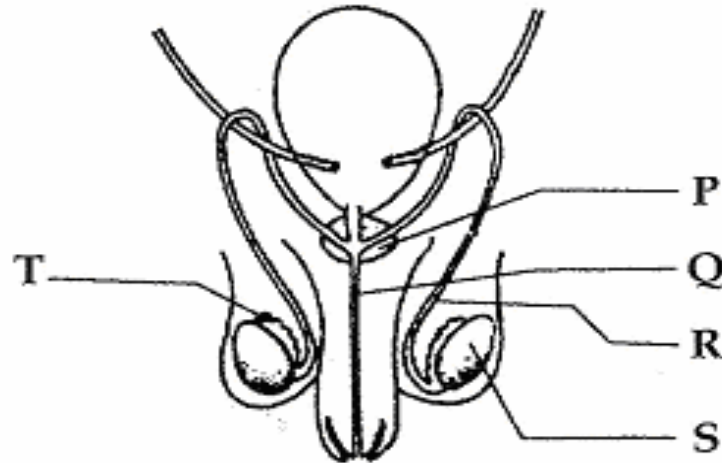
The advantages of breast milk compared with bottle feeding

During pregnancy the mother's breasts enlarge and the mammary glands inside them get ready to secrete milk. Soon after birth the baby starts to suck its mother's nipples. This stimulates the breasts to release the milk and make more.

Breast milk is a perfect food, **containing all the chemicals that the baby needs at just the right temperature.** It also **contains antibodies which may help to protect the baby from certain diseases and allergies.** Breast-feeding **allows a close contact between the mother and the baby** – and it's **cheaper than bottle-feeding.**

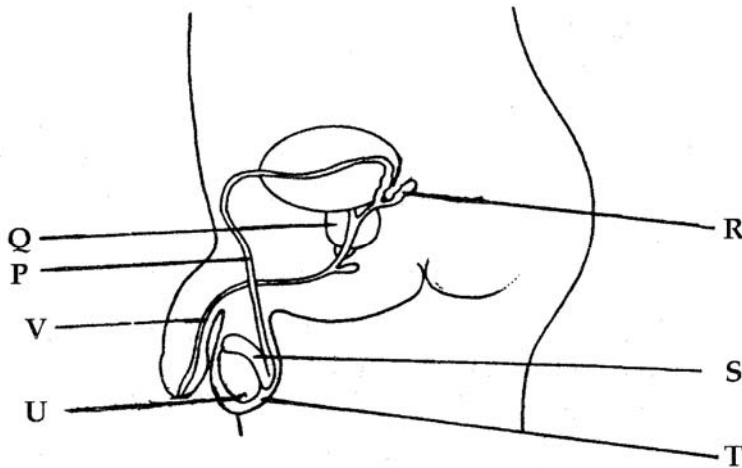
Questions

1. The diagram shows the reproductive system of a human male.



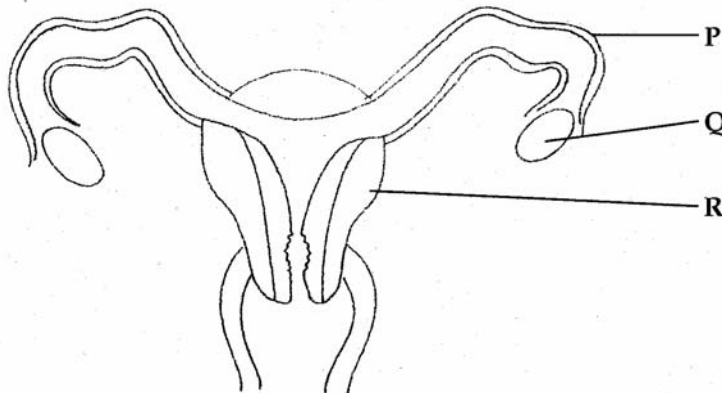
- (a) (i) Name the structure P. (1)
 - (ii) List TWO male secondary sexual characteristics.(2)
- (b) Name the labeled structure that is part of both the excretory and reproductive systems. (1)
- (c) (i) State the name of the organ in females that has a similar function to S. (1)
 - (ii) What would be the effect of decreased testosterone level on the function of S? (1)
- (d) Explain why it is important that the testes be located outside the body. (2)
- (e) How are the sperm cells found in T different from sperm cells in Q? (2)

2. The diagram shows the reproductive system of a human male.



- (a) (i) Where are the male gametes stored? (1)
 (ii) Trace the path of sperms, using the letters from where they are stored until they are released from the body. (1)
 (iii) Explain why it is necessary for several million sperms to be released during sexual intercourse. (2)
- (b) (i) Describe TWO effects on an adult male human's body if the testes are removed before puberty. (2)
 (ii) What function do Q and R serve during mating? (2)
 (iii) Name the structure where a surgical method of birth control could be performed. Explain why this method is effective. (2)

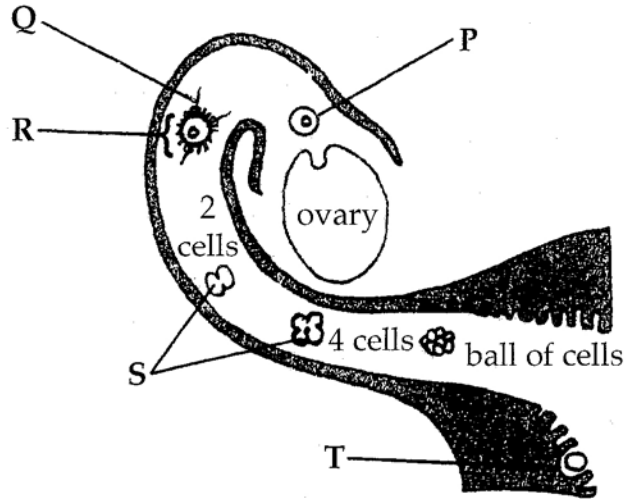
3. The diagram shows the human female reproductive system.



- (a) Name the structures labeled P, Q and R. (3)
 (b) Name the hormone which is responsible for preparing the lining of the uterus for implantation. (1)

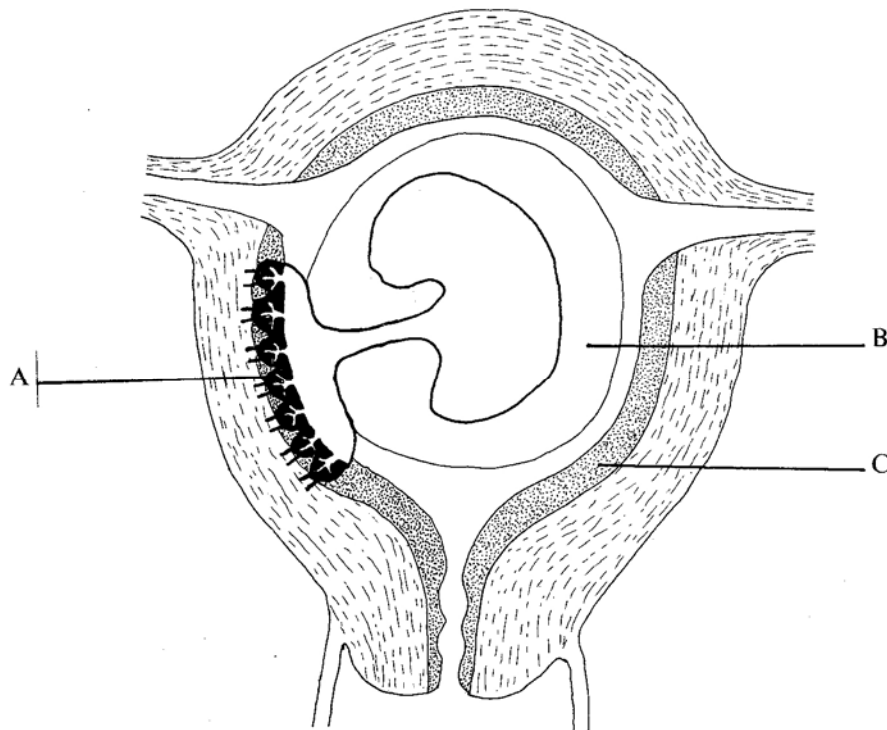
- (c) Name the structure in the male reproductive system that serves a similar function to that of P. (1)
- (d) What would be the effect on fertility if the fallopian tubes were completely blocked? (1)
- (e) (i) Describe TWO physical changes that occur in R during pregnancy. (2)
 (ii) Why is pregnancy no longer possible when menopause occurs? (2)

3. The diagram represents a part of the female reproductive system.



- (a) Name the process occurring at R and at T. (2)
- (b) What form of cell division occurs at S? (1)
- (c) Give the names of structures P and Q. (2)
- (d) (i) Name the organ that will be formed at T. (1)
 (ii) Describe how the organ in (d) (i) will be important to the developing foetus. (2)
- (e) Blood vessels develop in the umbilical cord of the foetus. Explain how the function of these blood vessels is similar in function to the pulmonary artery and the pulmonary vein in an adult. (2)

4. The diagram below shows the uterus of a pregnant woman.



- Name THREE substances which are likely to pass from the woman's blood into that of the embryo at A. (3)
- Name the substance found at B and give its function. (2)
- Name the hormone that maintains the thickened lining of the uterus at C during pregnancy. (1)
- Describe FOUR physical effects on the foetus and the baby caused by a pregnant woman who smokes. (4)