

- The different stages of the cycle are controlled by a set of four hormones – FSH & LH from the pituitary; OES & PROG from the ovary
- Releasing hormone from hypothalamus - stimulates anterior lobe of the pituitary gland to release FSH. FSH stimulates development of follicles in ovary. The follicle cells secrete oestrogen
- Oestrogen stimulates the repair of the uterus wall and also inhibits the further release of FSH so no new follicles develop in case pregnancy results. The follicle matures into a Graafian follicle
- Oestrogen levels rise to a peak, with a surge shortly before ovulation (day 12-14). The surge in oestrogen stimulates the release of LH from the pituitary. LH also causes a slight surge in FSH
- The surge of LH causes ovulation (release of the egg from the Graafian follicle into the oviduct) and the development of the corpus luteum "yellow body". Levels of LH and FSH decline after day 14
- The corpus luteum secretes progesterone. Progesterone inhibits the release of FSH and LH by the pituitary gland
- Progesterone also stimulates the thickening and the vascularisation of the uterus wall in preparation for pregnancy and implantation of the fertilised egg (embryo) – which takes about 7 days to reach the uterus. During this time the fertilised egg divides a number of times to form a ball of cells, termed the embryo. The embryo is then implanted in the wall of the uterus.
- The CL continues to secrete progesterone to maintain the lining. The placenta is formed, which also produces the hormone human chorionic gonadotrophin (hCG). hCG maintains the CL and the secretion of progesterone and oestrogen from the ovaries
- If the egg is not fertilised, the CL breaks down and stops making progesterone and menstruation occurs. FSH is no longer inhibited – a new follicle develops

The umbilical cord contains

Umbilical artery – carries **deoxygenated** blood, CO₂, urea & heat from foetus to placenta

Umbilical vein – carries **oxygenated** blood from placenta to foetus (carrying O₂ and nutrients)

Villi - provide a massive surface area over which transport of molecules can take place.

Nutrients are carried by the **mother's artery to the placenta**. They diffuse into the capillaries of the foetus. They are taken **to the foetus by the umbilical vein** – e.g:

- ★ Oxygen **diffuses** from mother's blood to foetal blood;
- ★ Carbon dioxide and urea diffuse from foetal blood to mother's blood;
- ★ Glucose, amino acids and vitamins move by **facilitated diffusion** into the foetal blood;
- ★ Sodium, potassium and calcium are **actively transported** into the foetal blood.

Antibodies - pass from mother to foetus to give the foetus passive immunity during the pregnancy and for a few months after birth.

Waste substances from the foetus are carried by the umbilical artery. They diffuse into the blood-filled space and into the mother's vein to be carried away.

Throughout pregnancy, the placenta releases oestrogen, progesterone, HPL (Human Placental Lactogen), and HCG (Human Chorionic Gonadotropin).

- Oestrogen:** ✓
- ✓ Stimulates growth of uterus.
 - ✓ Inhibits release of FSH.
 - ✓ Stimulates the duct system of the breasts to develop.
 - ✓ Inhibits lactation by inhibiting the release of **prolactin**.
 - ✓ Increases the sensitivity of the uterus to the hormone **oxytocin** (this causes the uterus wall to contract).
- Progesterone:** ✓
- ✓ Maintains the endometrium.
 - ✓ Inhibits myometrium contractions (therefore decreasing the possibility of miscarriage).
 - ✓ Stimulates the development of milk glands in the breasts.
 - ✓ Inhibits the release of prolactin.
 - ✓ Inhibits the release of FSH.
- HPL:** ✓
- ✓ Stimulates the growth and development of breasts. **Note:** Without HPL oestrogen and progesterone would not affect the breasts.
- HCG:** ✓
- ✓ Maintains the corpus luteum for about 3 months. This means that oestrogen and progesterone are produced before the placenta assumes this role.

Boys have a bigger growth spurt at puberty – hence, men are usually taller and heavier than women by the time growth ends (18-20)

Girls are often taller than boys at 12-13

Growth under the control of GH (anterior pituitary) – underproduction leads to dwarfism – overproduction leads to gigantism (very tall with large hands and feet)

Puberty

Maturation of sex organs and appearance of secondary sexual characteristics, accompanied by emotional changes (self image; reaction to authority; independence; identity crisis; responsibility; family relationships (good or bad), etc

Male	Female
Hormone – Testosterone	Hormone - Oestrogen
Sperm production - testes	Egg production + ovulation - ovaries
Ejaculation	Menstruation
Growth of hair (pubis + axilla)	Growth of hair (pubic + axilla)
Growth of facial hair	Growth of breasts (milk + sexual attraction)
Deepening of voice	Widening of the hips
Oily skin (sebum)	Oily skin (sebum)
Testis, penis, and scrotum enlarge	Vagina + uterus enlarge
Increase muscular strength	

Adulthood (General)

Physical growth and development are complete

Capable of living independently of family

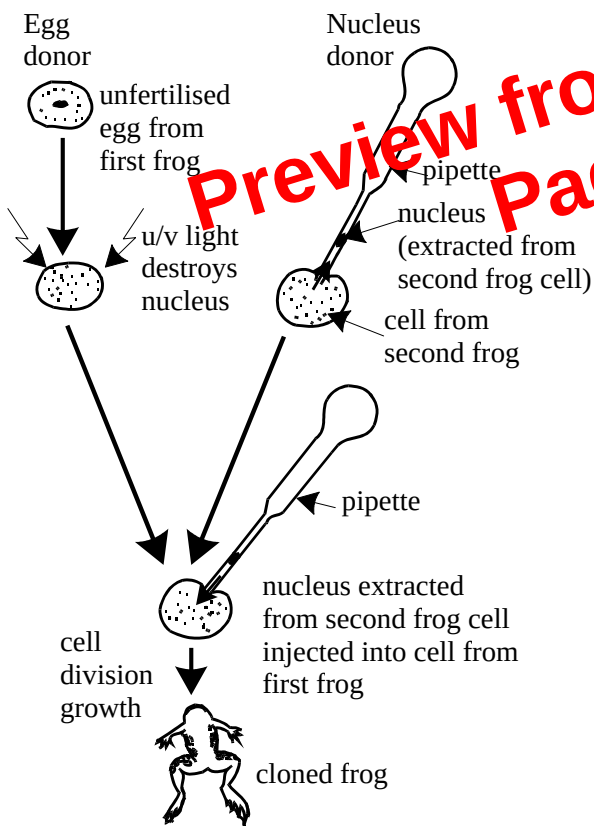
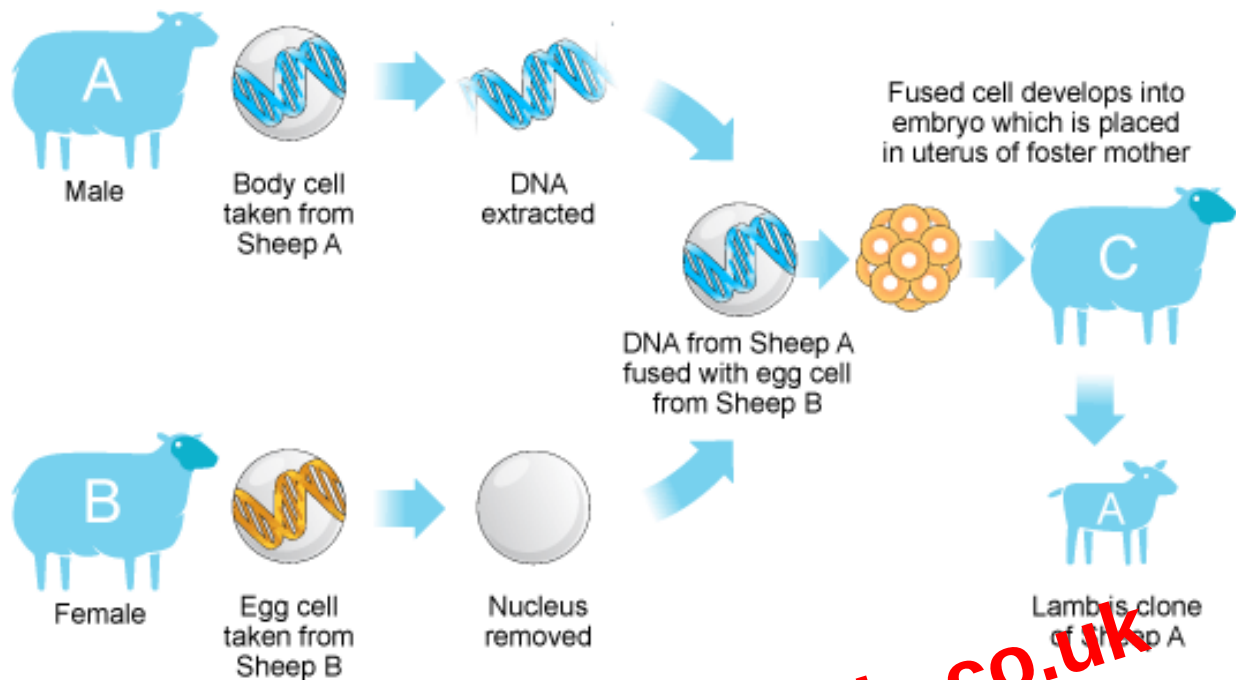
End of formal education and starting of full-time work

Form sexual relationships

Have children

Women (45 – 55) - undergo menopause – menstrual cycle stops permanently. Up to menopause, menstruation may stop temporarily due to:

Produces exact copies
Genes copied within same species



(a) Cloned frog is identical to second frog
Nucleus comes from this frog;
DNA/genetic information in nucleus; this controls development

(b) **Advantages of cloning**
large number of identical offspring;
guaranteed desired features; quick; economic

(c) **Disadvantages of cloning**
may all succumb to unexpected disease/change in conditions
cut adaptation/reduce gene pool/limits variation

Plants can be cloned artificially using cuttings