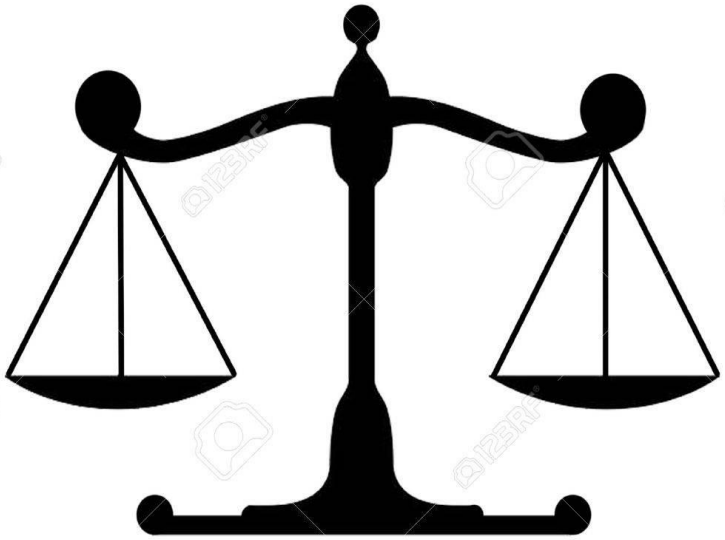
Co-ordination and control - COMBINED



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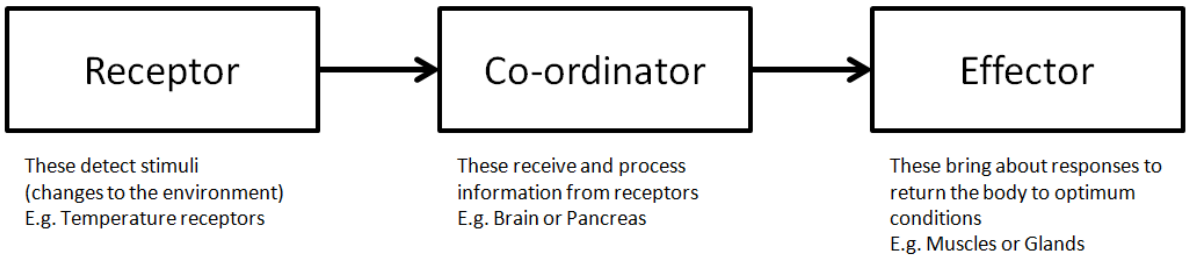
L1 What is Homeostasis

Humans have been able to colonise most of the earth. Even in extreme environments, like the Arctic Circle and the Sahara desert, humans can live and thrive. Surprisingly, we are actually not very good at surviving in these places without our technology. Humans, like all mammals need to maintain a constant internal environment. If our core body temperature, blood glucose levels, or water levels change too much we can get very ill or even die. If you recall, in the organisation topic, enzymes are very specific. Changes in conditions affect their shape causing them to **denature**. Enzymes are the main reason for homeostasis.

To prevent this, our body has several systems which it uses to maintain a constant internal environment. **Homeostasis** is the regulation of the internal conditions of a cell or organism to maintain **optimum conditions** for function in response to internal and external changes.

Homeostatic mechanisms are so important for your survival that they are **automatic**. This means your body constantly adjusts without you having to consciously think about it. The all follow the same basic structure.



Homeostatic control mechanisms come in two forms:

- **Nervous** responses: These use nerves to transfer information from the receptors to the brain and spinal cord (co-ordinators) and then to effectors.
- **Hormonal** responses: These use hormones which are released from various organs and travel through the blood stream to various effectors.

Negative feedback is a regulatory mechanism that helps maintain stable internal conditions within an organism. When a conditions change from a set point, negative feedback mechanisms are activated to counteract this change. It involves receptors detecting the change, triggering effectors, which work to reverse the change and restore the original balance. Once conditions return to set point the corrective mechanism switches off. Negative feedback is essential in various biological processes, such as temperature regulation and maintaining blood glucose levels. It ensures that organisms can adapt to their ever-changing environments and maintain homeostasis.

Independent practice

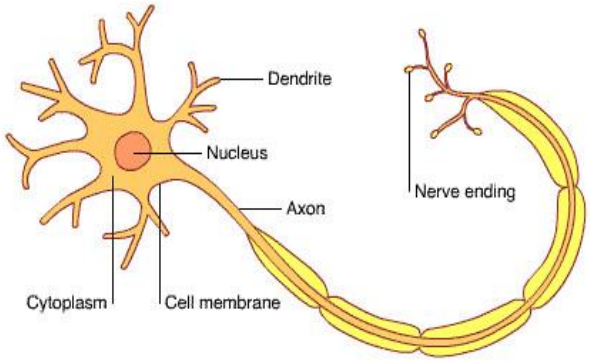
1. Define 'homeostasis'
2. Explain the term 'Internal environment'
3. List 3 things humans, and all mammals, must keep constant to survive.
4. **Extended writing (paragraph needed)** Explain why homeostasis is essential for survival.
5. Homeostasis is automatic, what does this mean?
6. What is a receptor? Give an example
7. What is a co-ordinator? Give an example
8. What is an effector? Give an example
9. **Extended writing** (paragraph needed) Explain how the receptor, co-ordinator and effector work together in homeostasis.
10. What are two differences between nervous and hormonal responses?
11. What does 'optimum' mean?
12. Describe negative feedback
13. Give two examples of negative feedback in the human body
14. Complete the sentences:

    Mammals need homeostasis because…
    Mammals need homeostasis but….
    Mammals need homeostasis therefore….

L2 Nervous System

The nervous system is specifically adapted to react to our surroundings and coordinate our behaviour. The nervous system uses **electrical** and **chemical** signals so send information rapidly. Some can even reach speeds of over 100m/s!

The nervous system is made of nerve cells (neurones). **Neurones** are specialised cells which can carry electrical impulses along their long thin cytoplasm, called an **axon**. Neurones come in 3 main forms **sensory** neurone, **relay** neurone and **motor** neurone.



Sensory neurone	These connect receptors to the coordinator
Relay neurones	These coordinate the correct response to the stimulus
Motor neurone	These send the signal from the coordinator to the effector

A **stimulus** is a **change** in the internal or external environment. A **receptor** is a specialised cell that **detects a stimulus**. The **coordination centre** receives and processes electrical impulses from receptors via the sensory neuron. A signa; goes from the sensory neuron to the relay neuron. From the relay neuron to the motor neuron. From the motor neuron to the effector, which is a muscle or a gland. The **effectors** bring about **responses** to the stimulus. A **response** could be a muscular contraction or release of a hormone.

The **coordinators** for the nervous system are the **brain** and the **spinal cord**. These are known collectively as the **central nervous system (CNS)**. The CNS is responsible for coordinating all the sensory information around you, all your thoughts and maintaining all your internal systems (e.g. heart and breathing rate).

Where a nerve ends and joins to another there is a gap.

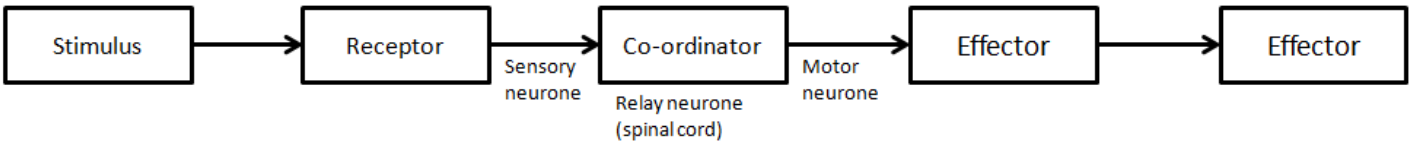
This gap is known as a **synapse**. At the synapse, the electrical signal is transferred into a chemical signal that diffuses across the gap. The synapse is important as it allows the nervous system to direct the signal to the right location.

Independent practice

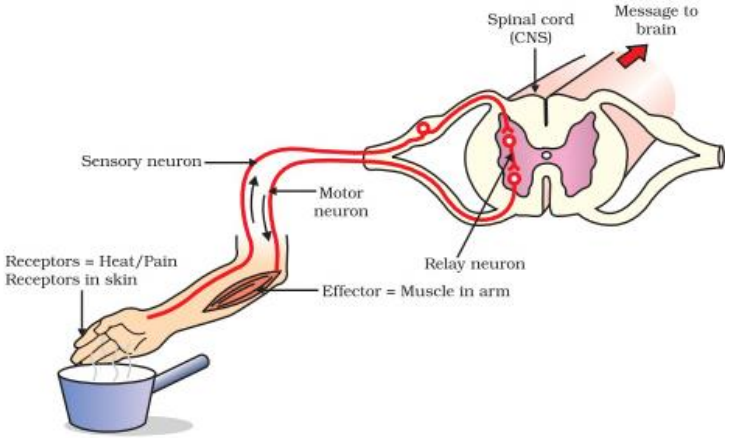
1. Name the three types of neurones.
2. Explain why neurons have a long structure.
3. What is the primary function of sensory neurons in the nervous system?
4. How do sensory neurons detect stimuli from the environment?
5. **Extended writing** (paragraph needed) Explain the pathway that information travels along from the stimulus to the central nervous system.
6. Give an example of a sensory organ and the type of stimulus it detects.
7. What role do relay neurons play in the nervous system?
8. Where are relay neurons typically located within the central nervous system?
9. Describe the function of relay neurons in transmitting signals between sensory and motor neurons.
10. What is the primary function of motor neurons in the nervous system?
11. **Extended writing** (paragraph needed) Explain the pathway that signals travel along from the central nervous system to coordinate a response.
12. How do motor neurons enable the body to respond to sensory stimuli or commands from the brain?
13. What is a synapse, and where does it occur within the nervous system?
14. Describe the process of signal transmission across a synapse, including the role of neurotransmitters.

L3 Reflexes

Reflexes are automatic responses hard-wired into your body. This means the signal never goes to your brain. The relay neurones in the spinal cord coordinate the response and your body will respond without the need for you to think about it. A good example is in the eye. When the light levels are low, and it is dark your iris contracts and your pupils get bigger. If you move into the light, your eyes detect the increase in light and automatically your iris will relax, and the pupils will shrink. This happens without conscious thought. Below is a diagram showing the basic structure of a reflex arc.



Another example of a reflex arc is in response to pain. Imagine accidently touching something hot or a pin with your hand. Your body will respond by instantly withdrawing your hand.



Independent practice

1. What is the scientific word for a nerve cell?
2. What is the name for the cells which detect changes in the environment?
3. Does the signal go to the brain in a reflex.
4. Name the 3 types of neurone in a reflex arc
5. Why is a reflex arc automatic?
6. **Extended writing** (paragraph needed) Explain why reflexes are important, provide at least once example.
7. How is a motor neurone different from a sensory neurone?
8. Complete the sentences below:
    a. *A reflex arc does not travel to the brain because….*
    b. *A reflex arc does not travel to the brain but……*
    c. *A reflex arc does not travel to the brain so…..*
9. **Extended writing** (paragraph needed) Roger sits on a pin. He screams and jumps up. Describe the journey of the signal through a reflex arc. Make sure you include as much detail as possible.
10. Many human actions are reflexes. Which **two** of the following are examples of reflex actions?
    A. Jumping in the air to catch a ball
    B. Raising a hand to protect the eyes in bright light
    C. Releasing saliva when food enters the mouth
    D. Running away from danger
    E. Withdrawing the hand from a sharp object

11. Reflexes are often considered automatic responses, but can they be influenced or controlled by our conscious thoughts? Explain with examples.
12. How do reflexes vary among individuals, and what factors might influence the speed and effectiveness of a reflex response?
13. In some situations, a reflex response can be detrimental to an individual. Can you provide examples where a reflex, meant for protection, could lead to harm in certain circumstances?
14. Imagine you are a scientist studying reflexes. What experiments or research questions could you design to better understand the underlying mechanisms and adaptability of reflexes in different situations?

L4 Reaction time

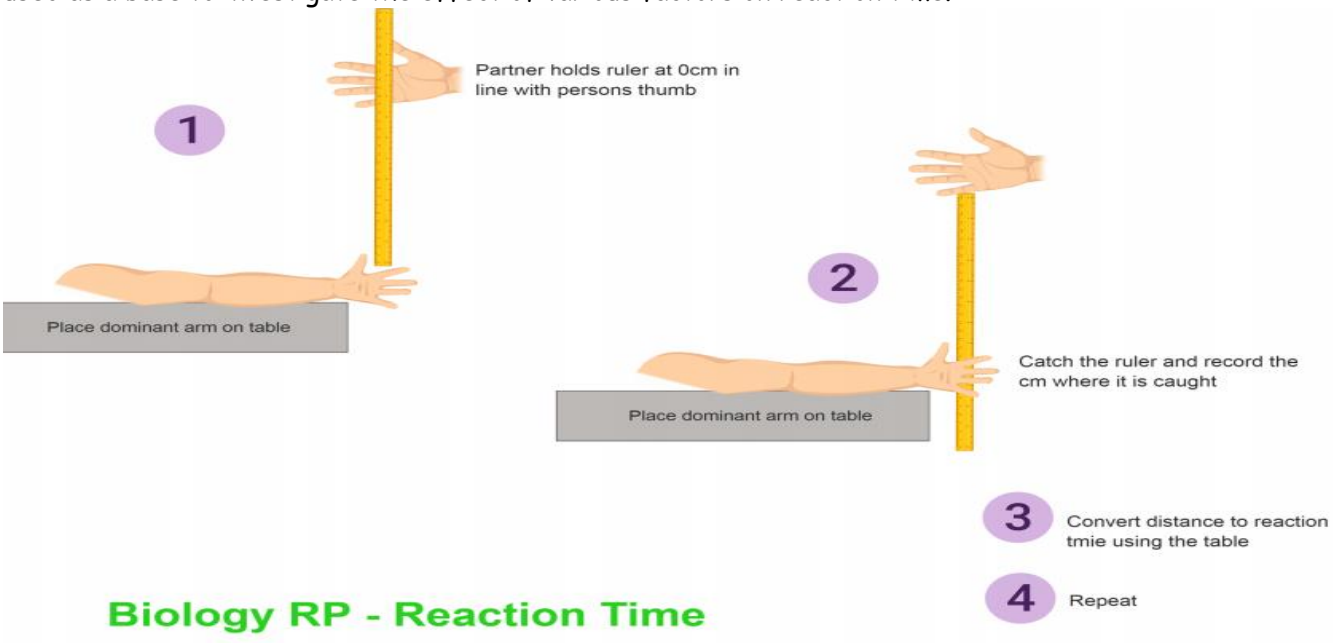
The Importance of Reaction Times:
Understanding reaction times is fundamental in comprehending the survival and adaptation mechanisms of living organisms. Every species, from microscopic bacteria to complex mammals, relies on their ability to react swiftly to external stimuli to ensure their survival.

Factors Influencing Reaction Times:
A multitude of factors influence an organism's reaction time. These include:

1. Nervous System: The efficiency of an organism's nervous system directly affects its reaction time.
2. Stimulus Type: Different types of stimuli evoke varying response times. For example, auditory stimuli often lead to quicker reactions than visual ones.
3. Age and Health: As organisms age, their reaction times tend to slow down. Additionally, an individual's overall health and state of alertness play a role in determining reaction times.
4. Genetics: Genetic factors can also impact reaction times, as they influence the structure and function of an organism's nervous system.

Experimentation in Reaction Times:
To study reaction times, biology students may conduct experiments that involve measuring an individual's response to a specific stimulus. Common experiments involve testing visual and auditory reactions. For instance, a student might measure the time it takes for a test subject to press a button upon hearing a sound or seeing a flash of light.

The reaction time RPA experiment is the ruler drop test, which is shown in the diagram below. It can be used as a base to investigate the effect of various factors on reaction time.



Applications in Medicine:
The study of reaction times has practical applications in the medical field. Neurologists and psychologists use reaction time tests to assess a patient's neurological health, especially in cases of brain injuries, concussions, or cognitive impairments.

Independent practice

1. What are reaction times.
2. Give an example of a situation where a fast reaction time is crucial for an organism's survival.
3. What are the different factors that can affect an individual's reaction time?
4. Name the experiment that can be used to investigate reaction times.
5. Give the independent and dependent variables of the RPA experiment on reaction time..
6. **Extended writing (paragraph needed)** Explain how to investigate the effect of sugar on reaction time.
7. In what medical scenarios are reaction time tests used, and why?
8. What is the link between reaction time and natural selection?
9. **Extended writing (Paragraph needed)** Reaction time can also be tested on a computer, pressing a button in response to a stimulus. Compare the ruler drop test to the computerised test.
10. How would you explain the concept of reaction times to someone who has never heard of it before, using simple language and examples?
11. Can you think of a day-to-day situation where fast reaction times are important for safety? Describe the scenario and explain why quick reactions are necessary.
12. What are some practical ways that people can improve their reaction times in everyday life? Can you think of any exercises or activities that might help?
13. Imagine a world where all organisms had incredibly slow reaction times. How might this impact their ability to survive and thrive in their environments?
14. Explore the connection between reaction times and cognitive functions like decision-making and problem-solving. How might an individual's reaction time affect their ability to make quick, informed decisions in various situations?

L5 The endocrine system

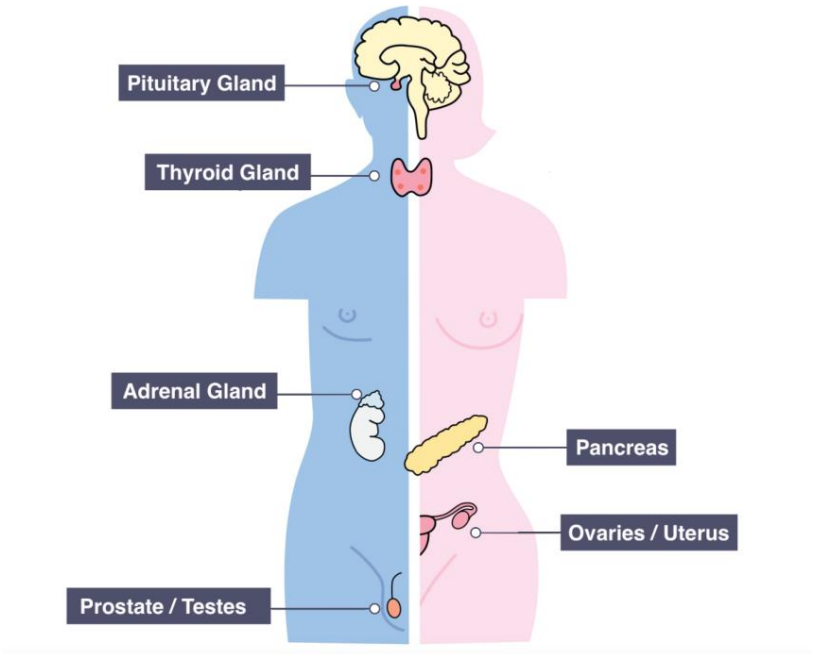
Insert explanation.

Hormones are chemical messengers. The endocrine system is the name of the series of organs and glands which coordinate changes in the body using hormones. A gland secretes a hormone into the blood. The hormone travels through blood stream until it reaches its target organ. The advantage of hormonal coordination is it can have a more long-lasting effect. The disadvantage is that it takes longer to work. A good example of this is **puberty**. Sex hormones (oestrogen and testosterone) are released from the sexual organs and cause the changes to the body over several years.

Feature	Endocrine system	Nervous system
Type of signal	Chemical (hormones)	Electrical (and chemical across synapse)
Organs	Glands	Brain and spinal cord
Transmission	Through the blood	Along neurones
Speed	Slow release	Fast release
Effect	Longer lasting, widespread	Short lived, localised

The endocrine system has a 'master gland' called the pituitary gland. It secretes several hormones which in turn affect other glands which secrete different hormones. It plays a large role in both homeostasis and our body's stress response.

Below is a diagram showing the main organs of the endocrine system



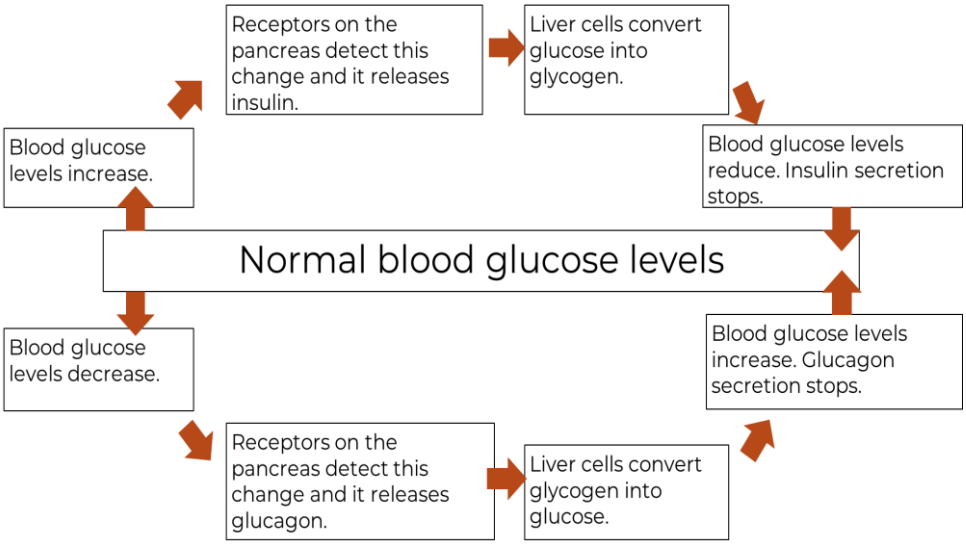
Independent practice

1. What are hormones?
2. How do hormones travel around the body.
3. What secretes hormones?
4. Where does a hormone travel to?
5. **Extended writing (Paragraph needed)** Write a comparison of the endocrine system and the nervous system.
6. A person needs to respond to a stimulus quickly, what system will it be that brings about the change?
7. Where is the pituitary gland.
8. A patient has a non-functioning pituitary gland, suggest what the consequences will be.
9. Name the gland located above the kidney.
10. Evaluate the statement "The endocrine system is like the postal system"
11. A dentist will sometimes check to see if a gland is swollen in the neck, what gland are they checking?
12. Glands can be described as underactive or overactive. Suggest what this means.
13. **Extended writing (paragraph needed)** If humans could only have either the endocrine system or the nervous system, explain which would be more advantageous for survival?
14. If puberty was controlled by the nervous system suggest how it would be different.

L6 Control of blood glucose

We need a supply of glucose in our blood so that our cells can respire efficiently. The problem is glucose is soluble so affects the osmotic potential of the blood plasma. If there is too much sugar in the blood then water will leave the red blood cells, by osmosis through the cell membrane. This causes the red blood cells to shrivel and become unable to carry oxygen. Conversely, if there is too little glucose in the plasma then the water will move from the plasma to the red blood cells by osmosis. This causes the red blood cells to swell and even burst. The endocrine system is responsible for maintaining a constant blood glucose level in the body.

The pancreas is the main organ responsible for detecting and controlling the blood glucose levels of the blood. The liver plays a role in the storing of glucose as insoluble glycogen.



Diabetes is a disorder where a person cannot control their blood glucose concentration on their own. It comes is two forms summarised below.

	Type 1	Type 2
Caused by	Body's immune system accidently attacking pancreas cells	Poor diet and obesity over a long period of time
Effect	Pancreas no longer makes insulin	Liver is unable to recognise insulin in the blood
Consequence	Blood sugar rises	Blood sugar rises
Treated by	Injections of insulin	Carbohydrate controlled diet, exercise and medication

- Symptoms of diabetes include: Urinating (pee) a lot, are very thirsty, lose weight without trying, are very hungry and are fatigued.

Independent practice

1. What is the role of the pancreas in homeostasis?
2. Name the endocrine gland that controls blood glucose level (BGL).
3. What is the effect of insulin on BGL?
4. Name the hormone that increases BGL.
5. Name the organ that secretes the two hormones to regulate BGL.
6. **Extended writing (Paragraph needed)** Explain how blood glucose levels are regulated. (6)
7. When would a person's BGL increase during a day (24hr)?
8. Explain the **primary** reason why a person's BGL would decrease eventually.
9. Explain the importance of maintaining a stable blood glucose level.
10. What is diabetes?
11. Describe two differences between types 1 and 2 diabetes.
12. State three symptoms of diabetes.
13. **Extended writing (paragraph needed)** Type 1 diabetes is a genetic disorder that is usually diagnosed early in life. Explain how a patient will regulate their blood glucose levels. (6)
14. The insulin used to treat diabetes used to come from pigs. What were the potential issues with treating insulin that came from pigs.

L9 Puberty and the Menstrual cycle

Puberty is the period of development during which a child's body undergoes remarkable changes, transitioning into adulthood. It typically occurs between the ages of 9 and 16, but the exact timing varies from person to person.

Hormones are at the heart of puberty. One of the key hormones involved in puberty is testosterone, which drives the male changes, while oestrogen is pivotal for female development. The growth spurt that accompanies puberty is due to the action of growth hormone.

Comparing puberty

1. Onset: Puberty typically begins around the ages of 9 to 16. In general, females tend to enter puberty slightly earlier than males.
2. Hormonal Changes: Both males and females experience an increase in sex hormones, but the specific hormones differ. In males, the key hormone is testosterone, while females experience an increase in oestrogen and progesterone.
3. Secondary Sexual Characteristics: Males develop facial and body hair, their voices deepen more than females, shoulders broaden, and they experience an increase in muscle mass. In contrast, females develop breasts, experience the growth of pubic and underarm hair, and have a more pronounced hip-to-waist ratio. Acne and changes in body odour are common experiences during puberty due to the increased activity of sweat and oil glands.
4. Reproductive System Changes: In females, the menstrual cycle begins, and they start ovulating, making them capable of reproduction. Males experience the enlargement of the testes and become fertile, producing sperm.
5. Growth Spurt: Both sexes undergo a growth spurt, but the timing and extent of this growth can differ. Males often experience a later and more prolonged growth spurt, which contributes to their greater average height.
6. Emotional and Psychological Changes: Puberty can bring about mood swings, increased emotional sensitivity, and changes in body image perception in both males and females. It's important to note that these emotional changes are individual and may not be uniform across all adolescents.

The menstrual cycle

The menstrual cycle is a crucial aspect of female biology, the average age to start menstruation is age 12 but can be as early as 8 or as late as 16.The length of the menstrual cycle varies between individuals. When discussing the menstrual cycle in GCSE it the cycle length used is 28 days. Within those 28 days it's divided into several phases. If the person does not fall pregnant the cycle starts again.

- Days 1-7: Menstruation (uterus lining breakdown)
- Days 8-13: Uterus lining thickens
- Day 14: Ovulation (release of egg)
- Days 15-28

There are 4 hormones involved in the menstrual cycle.

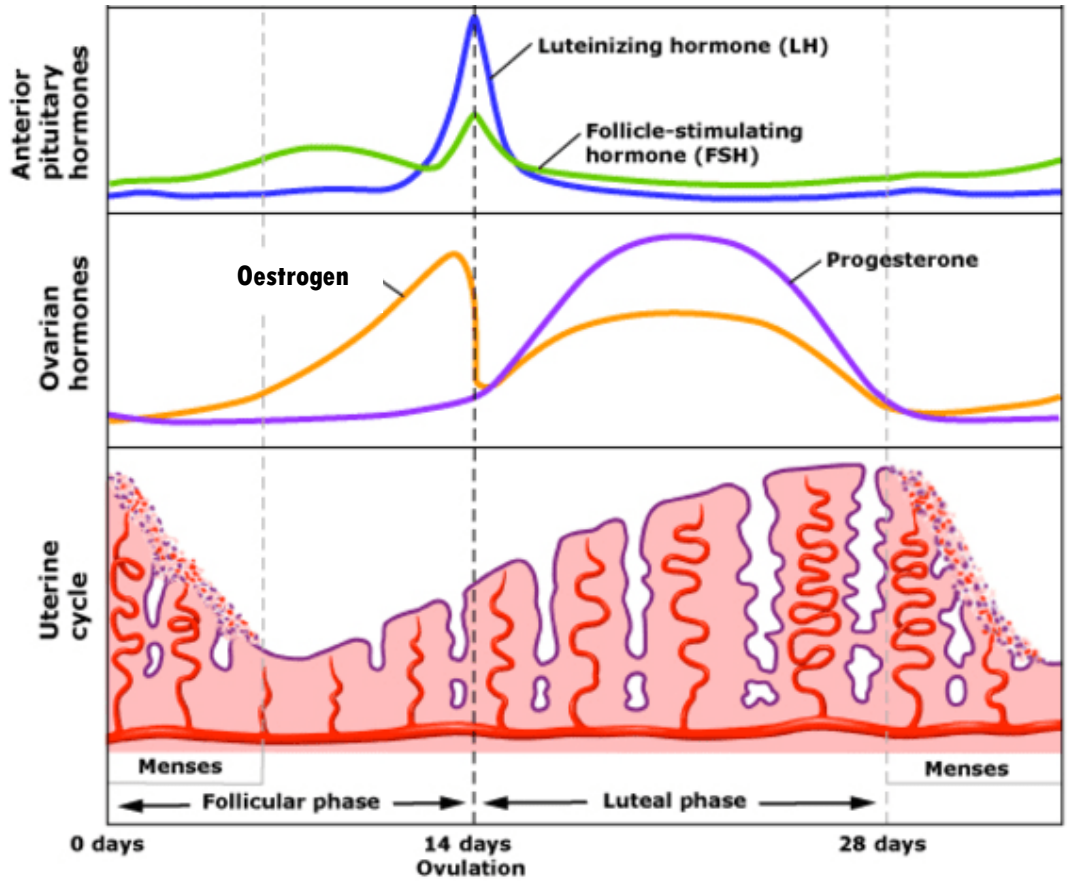
- **FSH** - matures the egg. Released by pituitary
- **Oestrogen** - thickens uterus lining. Produced by the ovaries.
- **LH** - causes ovulation (release of egg). Released by pituitary
- **Progesterone** – maintains uterus lining. Produced by the ovaries.

Independent practice

1. What is puberty, and why does it occur?
2. Between what age does puberty typically begin for most teenagers?
3. How does the onset of puberty differ between males and females?
4. What are some of the physical changes that boys experience during puberty?
5. What are some of the physical changes that girls experience during puberty?
6. **Extended writing (Paragraph needed)** Compare puberty in males and females.
7. What is the purpose of breast development in females during puberty?
8. State the difference between the terms the menstrual cycle and period.
9. Why is it important for the pelvis to widen during puberty.
10. **Extended writing (paragraph needed)** Explain how the changes in puberty in females prepares the body for motherhood.
11. A genetic condition called Turner's Syndrome results in less oestrogen being produced. Suggest what the symptoms of this condition are.
12. Polycystic ovary syndrome is a condition that causes hormonal imbalances, with one symptom being irregular or no ovulation. State what hormonal imbalance causes this symptom.
13. Klinefelter syndrome is a genetic condition where there is abnormal development of the testes. What effect will this have on the testosterone levels of the person, and suggest how this may affect puberty.
14. Suggest how puberty blockers work.

L10 Control of the menstrual cycle

The female reproductive hormones are synchronised to ensure the menstrual cycle follows a regular pattern. This is summarised in the diagram below

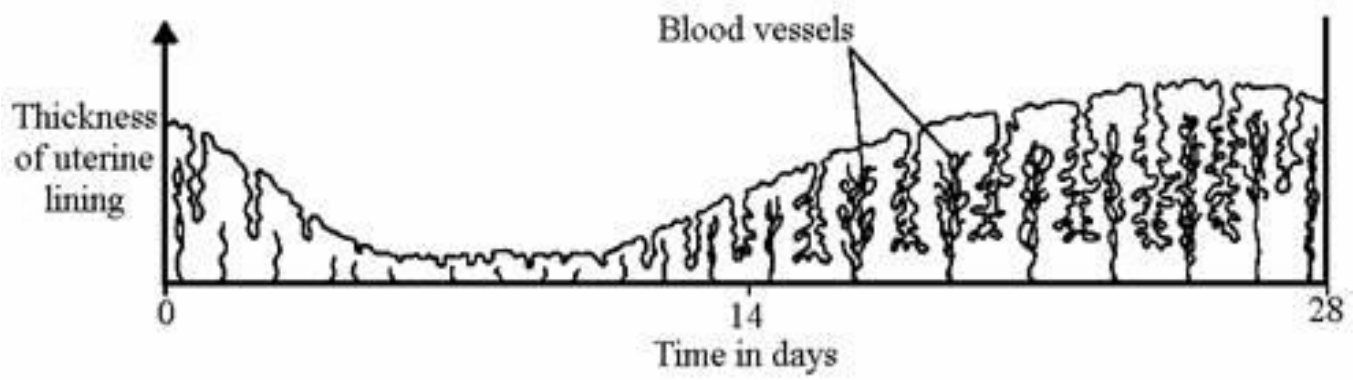


The cycle starts with menstruation. The lining is shed because oestrogen and progesterone levels are low. At the same time FSH begins to rise slightly, triggering a new egg cell to begin maturing. FSH stimulates Oestrogen production so oestrogen levels begin to rise and the lining of the uterus begins to re-grow.

A day or two before ovulation the levels of oestrogen, LH and FSH all reach their maximum. Once the egg is released they all begin to drop. Progesterone and oestrogen rise to maintain the lining of the uterus. If the egg is fertilised it will embed in the lining and progesterone and oestrogen will remain high. Oestrogen inhibits FSH, and progesterone inhibits the release of LH. This prevents a second egg being released during the 9 months of a gestation. If the egg is not fertilised, then progesterone drops and menstruation happens. The cycle repeats.

Independent practice

1. How many hormones are involved in the control of the menstrual cycle.
2. State what hormone oestrogen inhibits.
3. State what hormone LH is stimulated by.
4. Describe the hormonal interaction between progesterone and LH .
5. What happens when FSH and LH rise suddenly
6. Why does progesterone increase after ovulation?
7. **Extended writing (paragraph needed)** Describe the sequence of hormonal interactions in the menstrual cycle. [6]
8. What happens if the egg is fertilised, and why?
9. What happens if the egg is not fertilised.
10. Name the hormone that causes the release of the egg.
11. True or false: The ovaries releases oestrogen and FSH
12. Name the hormones involved in the menstrual cycle released by the pituitary gland.
13. A woman wants to have a baby. She has been told that her body is not making and releasing eggs. What hormones is she lacking?
14. **Extended writing (Paragraph needed)** Describe how changes in the lining shown in the diagram adapt it for its function if an egg is fertilised.



L11 Contraception

Contraception is an essential topic to understand, especially as you study biology. It's all about preventing pregnancy by controlling the process of fertilization. In this summary, we'll break down two main types of contraception: hormonal and non-hormonal methods.

Hormonal Contraception:

Hormonal contraceptives inhibit FSH production by releasing oestrogen and/or progesterone. This stops eggs maturing. The potential disadvantages include side effects such as headaches, nausea, sore breasts and vaginal yeast infections (thrush). The hormones can also cause spotting between periods or lead to mood swings, and may reduce women's sexual desire. There is also a small risk of blood clots forming (thrombosis).

- Birth Control Pills: These are tiny pills taken daily to prevent pregnancy. They contain hormones that stop the release of eggs, thicken cervical mucus to block sperm, and make the womb lining less suitable for an embryo to implant.
- The Contraceptive Patch: This is a small, sticky patch worn on the skin. It releases hormones that work in a similar way to birth control pills but is changed once a week.
- The Contraceptive Injection: It's a shot that is given every 8 to 12 weeks. This shot contains hormones to prevent pregnancy.
- Implants: These are small rods placed under the skin of the arm. They release hormones gradually and can work for up to three years.
- Intrauterine Device (IUD): A T-shaped device is inserted into the womb by a healthcare provider. There are hormonal and non-hormonal IUDs available.

Non-Hormonal Contraception:

Non-hormonal methods provide either a physical barrier or preventing embryo implantation.

- *Barrier methods:* Mainly the condom or the diaphragm. Both of these provide a physical barrier that prevents sperm entering the uterus. The condom has an added advantage of preventing the spread of STI's.
- *Copper Intrauterine devices (IUD):* Often called 'the coil' they are tiny plastic or metal devices that are inserted into the uterus. They aim to mimic an implanted embryo, stimulating progesterone and oestrogen and prevent a mature egg begin released.
- *Spermacidal gels:* These kill sperm on contact. Often added to barrier methods to improve their effectiveness.
- *Abstinence:* Various apps are now available to monitor the menstrual cycle. By doing this they can predict when you will have a low chance of conceiving if you have sex. This is the least effective method as sperm can survive inside the oviduct for a number of days.
- *Surgical sterilisation:* This is when a person is preventing from releasing sperm or eggs due to a small surgical procedure. In males it is a vasectomy, and in women it is a tubal ligation In both cases these are permanent procedures and come with some short term discomfort while you recover from the operation. They do not prevent the spread of STI's.

Independent practice

1. What is the common purpose of all forms of contraception?
2. What are the two main categories of contraception?
3. Which forms of contraception also prevent STI's?
4. Which forms of contraception are permanent?
5. Which hormones are found in hormonal contraception?
6. **Extended writing (paragraph needed)** Explain why a person may choose to not use hormonal contraception, and instead would use condoms.
7. Why would it still be recommended that a homosexual male wear a condom?
8. Brad says "I can't catch an STI because my girlfriend is on the pill" Is he right or wrong? Give a reason.
9. Duncan says "I don't like the feeling of a condom, but my girlfriend has bad side effects on the pill. I'm not sure what to do?" What advice would you give Duncan? Make sure you include reasons for any advice you give.
10. Susie says "I take my birth control pill every day that I had sex.". What is likely to happen?
11. **Extended writing (paragraph needed)** Evaluate the use of the contraceptive methods below.

Method	Effectiveness (%)	Other information
Contraceptive pill	99.8	Must be taken every day, free from GPs, side effects include headaches and increased blood pressure.
Condom	99.0	May tear, offer protection from STIs, inexpensive to buy.
Spermicide gel	75.0	Allergic reactions to gel can occur, easy to administer, inexpensive to buy.

12. A GP can refuse to carry out Tubal Ligation. Suggest why they are less likely to refer patients under the age of 30.
13. What are the key factors individuals should consider when choosing the most suitable contraceptive method for their specific needs and lifestyle?
14. What are the potential social, economic, and health implications of limited access to contraception, especially in underserved communities?

L12 Infertility

It is a cruel twist of irony that while some people spend a lot of time ensuring they cannot fall pregnant during sex; others spend years desperately trying to have child and not succeeding.

Fortunately, scientific developments over the last 50 years have been able to help couples in this situation.

Fertility drugs: These are mixtures of FSH and LH taken over a series of days. The aim is to help the egg cells to mature and be released. The woman can then fall pregnant in a traditional fashion.

IVF: In-Vitro Fertilisation is a sophisticated process that can help a couple conceive.

1. The woman is given a large dose of FSH and LH so she matures and releases many eggs
2. The eggs are collected and fertilised by the sperm from the father. This is done in laboratory conditions. The words 'in vitro' mean 'outside of the body'
3. The embryos develop in the lab
4. When the embryos are developed into a ball of cells, 1 or 2 embryos are implanted into the mother to be carried to term like a normal pregnancy.

About 60,000 of the 755,000 babies born last year were conceived via IVF. It is a vital service for some couples but it is not without its risks:

- It is physically and emotionally stressful on the woman
- Its success rates are also not very high (under 30%)
- There is a high chance of multiple births, which can put extra pressure on the mother and babies as they develop in the uterus. This increases the chance of complications during pregnancy.

IVF is also expensive; luckily it is available on the NHS in the UK for free. However not everyone is eligible for IVF on the NHS, the decision is made by The National Institute for Health and Care Excellence (NICE) fertility guidelines make recommendations about who should have access to IVF treatment on the NHS in England and Wales. These guidelines recommend that IVF should be offered to women under the age of 43 who have been trying to get pregnant through regular unprotected sex for 2 years.

In 2019, the percentage of IVF treatments that resulted in a live birth was:

32% for women under 35

25% for women aged 35 to 37

19% for women aged 38 to 39

11% for women aged 40 to 42

5% for women aged 43 to 44

4% for women aged over 44

Independent practice

1. Can you explain the concept of fertility drugs and what they aim to achieve?
2. What is the function of FSH?
3. What is the function of LH?
4. How are FSH and LH used in fertility treatments?
5. Why are some couples unable to conceive children naturally?
6. What does IVF stand for, and how does it differ from traditional conception?
7. **Extended writing (paragraph needed)** Describe the steps involved in the IVF process.
8. What is the significance of the term "in vitro" in IVF?
9. What are the risks associated with IVF treatments?
10. What is the success rate of IVF treatments in general?
11. How do the success rates of IVF vary with a woman's age?
12. How does the chance of multiple births in IVF affect mothers and babies?
13. Explain why despite the low success rates of embryo implantation why only 1 or 2 embryos are used in IVF.
14. **Extended writing (paragraph needed)** What are some ethical considerations related to assisted reproductive technologies like IVF?

L13 Adrenaline and Thyroxine

A negative feedback control system responds when conditions change from the ideal or set point and returns conditions to this set point. There is a continuous cycle of events in negative feedback because the change inhibits the signal (hormonal or nervous) causing the change.

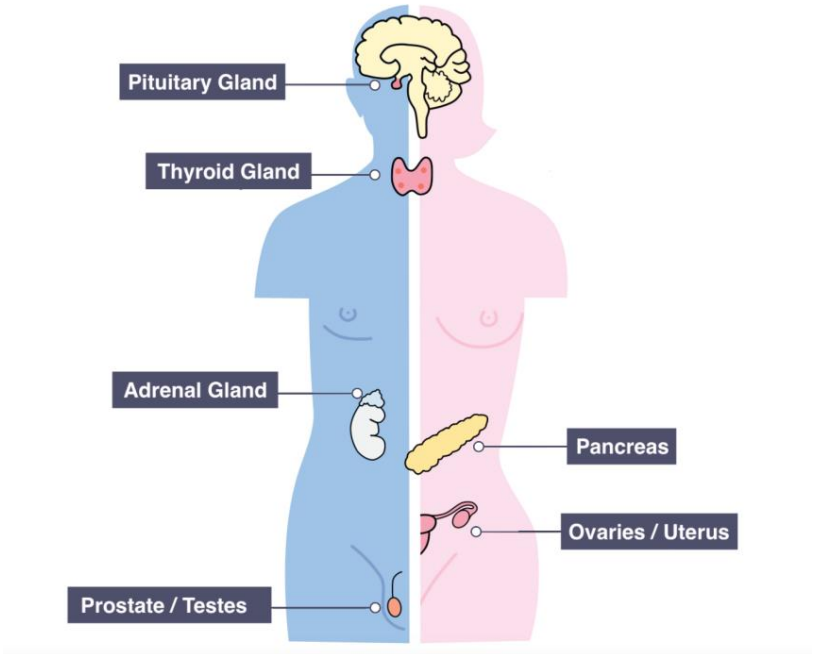
Thyroxin is a hormone made in your thyroid gland. Its function is to stimulate the **basal metabolic rate** in your body. Basal means 'base' so the basal metabolic rate is your base level of all your chemical processes in all your cells, just to live. It is vital to growth and development. The release of thyroxin by the thyroid is itself controlled by the pituitary gland of the hypothalamus.

- If the metabolic rate gets too high, thyroxin levels in the blood drop and it lowers.
- If the basal metabolic rate gets too low the thyroid secretes more thyroxin and the metabolic rate increases.
- By using a negative feedback loop the body tries to have a stable basal metabolic rate that is just right.

Adrenalin does not follow a negative feedback loop. Adrenalin is a hormone secreted by the adrenal glands above the kidneys. It is release when the body is in danger. The 'fight of flight' situations occur when a threat is perceived.

- Increase heart rate
- Increase breathing rate
- Convert glycogen to glucose
- Divert blood from other organ systems
- Increase delivery of oxygen and glucose to brain and muscles
- Prepare you for 'fight or flight' response

This is an evolved response to provide the best chance of escaping a dangerous situation.



Independent practice

1. What is the primary purpose of a negative feedback control system?
2. What is the role of thyroxin in the body, and where is it produced?
3. What does the basal metabolic rate refer to, and why is it important for the body?
4. What role does the pituitary gland play in controlling thyroxin levels?
5. A stimulus is the change in the internal or external environment. State what detect stimuli.
6. **Extended writing (paragraph needed)** Explain how a decrease in the basal metabolic rate is detected, and how it is subsequently raised by the body.
7. Why is it important for the body to maintain a stable basal metabolic rate?
8. Hyperthyroidism is caused by an overactive thyroid gland. Suggest what would happen in the body of a person with hyperthyroidism.
9. Describe the role of adrenaline in the body and when it is secreted.
10. What situations trigger the release of adrenaline in the body, provide 3 examples of these situations.
11. How does adrenaline affect the heart rate and breathing rate?
12. **Extended writing (paragraph needed)** Describe how the effects of adrenaline differ from the effects of thyroxin in the body?
13. Why is it necessary for adrenaline to respond quickly to threats, rather than through negative feedback?
14. EpiPens contain adrenaline. Suggest what would happen if a person was incorrectly injected with an EpiPens.