Meden School Curriculum Planning							
Subject	Biology	**Year Group**	11	**Sequence No.**	5	**Topic**	Homeostasis & Response

Retrieval	Core Knowledge	Student Thinking
What do teachers need **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **development of our students thinking, encouraging them to see the inequalities around them** and 'do something about them!'
Y7 Organisms & Body Systems L5: Stimuli are detected by **sense organs**. Sense organs have **receptors** which are groups of cells which are **sensitive** to **different stimuli. T**hey change the stimuli into **electrical impulses** which travel to the **brain.** The brain then decides on a **response.** The **central nervous system** (CNS) consists of the brain and spinal cord. A reflex is an **automatic rapid** response. We do not think about reflexes, they just happen (**automatic**). This is because the **brain** is **skipped** out which also makes reflexes **faster.** Reflexes **prevent injury.** **Y7 Organisms & Body Systems L6:** **Sensory neurons** which carry information from sense neurons to the central nervous system. **Relay neuron** which carries information between the sensory and motor neuron. **Motor neurons** which carry information from the central nervous system to muscles telling them to move.	**L1:** Conditions inside the body need to be kept **steady**, even when **external environment changes. Homeostasis** is the regulation of conditions inside the body (and cells) to **maintain** a **stable internal environment** in response to changes to the internal and external environment. There are three main components to controlling **blood glucose level, body temperature** and **water content**: **receptors, coordination centre (**including **brain, spinal cord** and **pancreas)** and **effectors. Negative feedback** allows this. When a level (such as temperature) gets too high or too low the body uses negative feedback to return the level to normal. Receptors detect a **stimulus (change in the environment),** the coordination centre receives, processes the information and organises a response. **Effectors** produce a response which counteract the change and restores it to **optimum** level. The effector will carry on producing the response for as long as its stimulated, this may cause another extreme change, but the receptor will detect this and negative feedback starts again. Negative feedback is **automatic.** **L2:** Organisms need to respond to **stimuli** to **survive.** A **single-celled** organism can just respond to its environment, but the cells of a **multicellular** organism need to communicate with each other first so they evolved **nervous** and **hormonal communication systems.** In **vertebrates** (animals with a backbone) the **central nervous system** (CNS) contains the **brain** and **spinal cord.** In mammals it is connected to the body by **sensory** and **motor neurons.** Sensory neurons carry information as **electrical impulses** from the receptors to the CNS. Motor neurons carry electrical impulses from the CNS to effectors. Effectors can be a **muscle** or **gland,** they respond to nervous impulses. **Receptors** are cells that **detect stimuli**. There are taste receptors on the tounge and sound receptors in the ear. Receptors can form part of larger, complex **organs** such as the **retina** in the back of the eye which is covered in **light receptor cells**. Effectors respond to nervous impulses and bring about a change. **Muscles contract** in response and **glands release hormones.** The connection between neurons is called a **synapse.** Nerve signals are transferred by **chemical** which **diffuse** across the gap. They set off a **new electrical signal** in the next **neurone.**	**L7:** Should **insulin** injections be free for everyone? **L8:** Should **sanitary products** be free? Should women have **paid time off** work if they suffer **period pains?** **L9:** Should **contraception** be free? Should **anyone any age** have access to free contraception? Should contraception be **taught** in **schools**? Should contraception be **taught more** in **schools**? **L10:** Should **IVF** be free until it is successful? Should people have to undergo **parenting tests** before undergoing IVF?

Y7 Organisms & Body Systems L7: The ruler being held just above the open hand, with the '0' (zero) level with the finger and thumb during the ruler drop practical. Conducting repeats for a more accurate mean and to identify any outliers. **Y7 Reproduction L1:** The female reproductive system consists of the **vulva, vagina, cervix, uterus, uterus lining, oviducts (fallopian tubes)** and **the ovaries.** **Y7 Reproduction L2: Periods** are part of the **menstrual cycle.** It lasts around **28-days** so periods occur once every month. A period is the **uterus lining breaking down** and leaving the body through the **vagina.** **Y7 Reproduction L5: Ovum** (egg cells) come from females; they are produced in the **ovaries**. S**perm** come from males. They are produced in the **testes.** **Y7 Reproduction L6:** Only **one sperm** will **fertilise one egg**. A fertilised egg will form a tiny ball of cells called an **embryo.** **Y7 Reproduction L8**: Puberty is controlled by chemicals called **sex hormones** that are released into our body. In girls, puberty starts when the **ovaries** start producing **oestrogen** and in boys it is when the **testes** start producing **testosterone**. These hormones can cause **mood swings,**	**L3:** Reflexes are **rapid** and **automatic responses** that don't involve the **conscious** part of the **brain**. They **reduce** the chances of being **injured.** If bright light is shone in the eye then the pupils automatically get smaller so less light can get in the eye and damage it. The passage of information in a reflex is called a **reflex arc.** Neurons in a reflex arc go through the **spinal cord** or through an **unconscious** part of the **brain**. When a stimuli is detected impulses are sent along the sensory neuron to the CNS. When the impulse reaches a synapse between sensory and relay neurone they trigger chemicals to be released so impulses can be sent along the relay neuron. The same thing occurs when the impulse reaches a synapse between a relay and motor neurone. The impulse then travels along the motor neuron to the effector. The muscle contracts of the gland release a hormone. As the response is **not thought about** (which takes time) this is a **quicker response.** **L4: Caffeine** is a **drug** that **speeds up** a person's **reaction time.** The person being tested should **sit** with their **dominant arm resting** on the **edge** of a **table**. A **ruler** should be held **vertically** between the **thumb** and **forefinger.** The **zero** end must be **level** with their thumb and forefinger. The ruler is **let go** of with **no warning.** The ruler should be **caught** as **quickly** as possible. Reaction time is measured by the **number** on the **ruler** where it is **caught.** The **further down** it's caught (the higher the number) the **slower** the **reaction time**. The person can be tested before and after consuming **caffeine**. There should be **at least ten repeats. Conversion tables** are used to convert the number on the ruler to a time. **Control variables** are people staying in the same roles, using the same hand, the ruler is to be dropped from the same height and the person being tested should not have had any caffeine previously. Too much caffeine can cause **unpleasant side effects** so more caffeine should not be drank for the rest of the day. **Computer tests** can also be used to measure reaction time. They can give more **precise** reaction time because they **remove human error** and as it is recorded in **milliseconds** it is also more **accurate**. It also removes the possibility of a person **anticipating** when the ruler will be dropped by reading **body language.** **L5:** Hormones are **chemical molecules** released directly into the **blood**. They are carried all over the body in the **bloodstream** and only affect **particular cells** in particular organs (**target organs**). Hormones control things in organs and cells that need constant adjustment. Hormones are **produced** in and **secreted** by **endocrine glands** that make up the **endocrine system**. The **piturity gland** (in the brain) produces many hormones that **regulate bondy conditions.** It is sometimes known as the **'master gland'** as the hormones it produce act on other glands directing them to release hormones that bring about change. The **thyroid** gland (in the throat) produces **thyroxine** which is involved in things such as **rate of metabolism, heart rate** and **temperature. Adrenal glands** (above the kidneys) produce **adrenaline** which is used to prepare the body for **fight or flight. Ovaries** (females only) produce **oestrogen** which is involved in the **menstrual cycle.** The **pancreas** produces **insulin** which is used to **regulate blood glucose levels**. **Testes** (male only) produce **testosterone** which controls **puberty** and **sperm production**. Nerves have **very fast action, act**	

acne, growing bigger and having a strong **body odor.** Girls and boys undergo **different physical changes** in addition to these such as **breast development** in girls and **facial hair** in boys. **Y7 Reproduction L9:** A woman is giving **fertility drugs** to produce many eggs. A sample of the father's **sperm** is collected. Eggs are removed from the mother's body and placed with the sperm in a Petri dish to allow **fertilization** to occur. A **microscope** is used to ensure the eggs are fertilized and growing properly. When the fertilized eggs have grown, 1 or 2 are placed in the mother's **uterus** for a normal **pregnancy.**	for a **very short time** and act on a **precise area**. Hormones have **slower action, act** for a **long time** and act in a **general way.** **L6:** Eating foods that contain **carbohydrates** puts **glucose** (a simple sugar) into the **blood** from the **small intestine**. Normal **metabolism** of cells removes glucose from the blood. **Vigorous exercise** removes much more glucose from the blood. **Excess glucose** can be stores as **glycogen** in the **liver** and in the **muscles.** The level of glucose in the blood must be kept steady. Changes are monitored and controlled by the **pancreas** using the **hormones insulin** and **glucagon** in a **negative feedback cycle**. Blood with **too much glucose** causes the pancreas to secrete **insulin**, this causes glucose to move from the blood into liver and muscle cells. Insulin makes the **liver turn glucose into glycogen** and so blood glucose level is **reduced.** Blood with **too little glucose** causes the pancreas to secrete **glucagon**. This causes the **liver to release glucose.** Glucagon makes the **liver turn glycogen to glucose** and so blood glucose level is **increased.** **L7: Diabetes** is a condition that affects the ability to control blood sugar levels, there are **two types**. **Type 1** is where the pancreas produces **little or no insulin**, blood glucose can rise to a level that can **kill.** These people need **insulin therapy** which usually involves **injections** of **insulin** throughout the day, most likely at meal-times. This ensures that glucose is removed from the blood quickly once food has been digested, stopping levels get too high. It is a **very effective treatment.** The amount of insulin injected depends on the **person's diet** and how **active** they are. They must also thing about **limiting the intake** of **food rich** in **simple carbohydrates** (such as sugars which cause blood glucose levels to rise rapidly) and take **regular exercise** which removes glucose from the blood. **Type 2** diabetes is when a person has become **resistant** to their **own insulin** and again, insulin levels rise to a dangerously high level. Being **overweight** increases the chance of developing Type 2 as **obesity** if a **major risk factor**. It can be controlled by eating a **carbohydrate-controlled diet** and taking **regular exercise.** **L8:** At **puberty** the body starts to release **sex hormones** which trigger **secondary sexual characteristics** such as development of facial hair in men and breasts in women. The **male** sex hormone is **testosterone,** produced by the **testes** and stimulates **sperm production**. The **female** sex hormone is **oestrogen,** produced by the **ovaries** which brings about physical changes but also plays a role in the **menstrual cycle.** Menstruation is a **28-day** cycle and has **four stages**. Day 1 (and Stage 1), menstruation starts, and the **uterus lining breaks down** for about **four days.** From day 4 to 14 (Stage 2) the lining of the u**terus builds up** again, it is a **thick spongy layer** full of blood vessels which is ready to receive a **fertilised egg**. Stage 3 is when an egg has developed and is released from the ovary at day 14, this is **ovulation**. Until day 28 (Stage 4) the **uterus wall** is **maintained.** If no fertilised egg has landed then the spongy layer starts to break down and the whole cycle begins again. **FSH** (follicle stimulating hormone) is produced in the **piturity gland**, it causes an **egg** to **mature** in one of the ovaries in a structure called a **follicle**. It also	

	stimulates the ovaries to produces **oestrogen. Oestrogen** is produced in the **ovaries,** causing the **lining** of the **uterus** to **grow**. It also **stimulates** the release of **LH** (luteinising hormone) and **inhibits FSH. LH** is produced by the **piturity gland** too and **stimulates ovulation. Progesterone** is produced in the **ovaries** by the **remains** of the **follicle** after ovulation, it **maintains** the **lining** of the **uterus** during the second half of the menstruation cycle. When the level of progesterone falls the uterus lining breaks down. It also **inhibits** the release of **LH** and **FSH.** **L9:** Oestrogen can be used to prevent the release of an egg and so can be used as a method of **contraception.** If oestrogen is taken everyday to keep the level in the bloodstream permanently high then it inhibits the production of FSH and after a while **egg development** and **production stop**. Progesterone also reduces fertility by stimulating the production of **thick mucus** which prevent sperm reaching the egg. The **pill** is an **oral contraceptive** containing oestrogen and progesterone (the **combined pill)** and it is over **99% effective** at preventing pregnancy. However, it can cause **side effects** such as headaches and nausea, it does not protect against **sexually transmitted diseases**. There is also the **progesterone-only pill**, which has **fewer side-effects** and is **just as effective**. The **contraceptive patch** contains oestrogen, is 5cm x 5cm and is stuck on the skin, it lasts one week. The **contraceptive implant** is inserted under the skin of the arm an releases **progesterone continuously** which stops the ovaries releasing eggs, makes it hard for sperm to swim to the egg and stops any egg implanting in the uterus. It can last for three years. The **contraceptive injection** also contains progesterone and each dose lasts 2-3 months. An **intrauterine device** (IUD) is a t-shaped device that is inserted in the uterus to kill sperm and prevent implantation of a fertilised egg. There are **plastic IUDs** that release progesterone **and copper IUDs** that prevent sperm surviving in the uterus. **Barrier contraception** are designed to stop the sperm from getting to the egg. **Condoms** are worn over the penis during sexual intercourse to prevent sperm entering the vagina. There are also **female condoms** that are worn inside the vagina. Condoms are the only contraception that will **protect against sexually transmitted diseases**. A **diaphragm** is a shallow plastic cp that fits over the cervix to form a barrier. It has to be used with a **spermicide** that kills or disables sperm. Spermicide can be used alone as a form of contraception, but it is not effective, only **70-80%. Sterilization** involves cutting or tying **fallopian tubes** in a female or **sperm ducts** in a male. This is a permeant procedure, but there is a very small chance the tubes can re-join. **Natural methods** involve finding out when in the menstrual cycle the woman is most fertile and avoiding intercourse on those days. It is popular with people who think contraception is unnatural, but it is **not very effective. Abstinence** is the only way to be completely sure that a woman is not pregnant, it involves **not having intercourse.** **L10:** Some women have levels of **FSH** that are **too low** to cause their eggs to mature, this means no eggs are released and the woman **can't get pregnant**. FSH and LH can be given to a woman as a **fertility drug**	

	to stimulate **ovulation.** It helps a lot of women get pregnant when they previously couldn't. However, it **doesn't always work** and some women have to do it many times so it is **expensive.** Too many eggs can also be stimulated which results in unexpected multiple pregnancies (twins and triplets..etc..). **IVF** involves collecting **eggs** from the ovaries and **fertilising** them in a laboratory using s**perm**. IVF can also involve **intra-cytoplasmic sperm injection** (ICSI) where a sperm cell is injected directly into the egg so it is useful for a man with a **very low sperm count**. The fertilised egg(s) are grown in an incubator in the laboratory into **embryos.** When the embryos are a **tiny ball of cells**, one or two of them are transferred to the woman's uterus to improve the chance of being pregnant. **FSH** and **LH** are given before egg collection to **stimulate several eggs** to **mature.** IVF can help **infertile** couples have a **child. Multiple births** can happen as more than one embryo may grow into a baby, this is risky for the mother and the baby as it **increases** the **risk** of **miscarriage** and **stillbirth.** The success rate of IVF is low, the average success rate in the UK is about **26%** so it is a **stressful** process and often **upsetting** especially if there are multiple failures. **Physical stress** for the woman can also be caused by a strong reaction to the hormones such as **abdominal pains, vomiting** and **dehydration**. Advances in **microscopic techniques** have helped to improve the techniques and success rate of IVF. Specialised **micro-tools** have been developed to use on the eggs and sperm under the microscope to **remove single cells** from the embryo for **genetic testing. Time-lapse imaging** using a microscope and camera built into the incubator means the growth of the embryos can be continually **monitored** to help identify those that are more likely to result in a successful pregnancy. IVF often results in **unused embryos** that are eventually **destroyed,** due to this some people think it is **unethical** because embryos are a **potential human life. Genetic testing** of embryos before implantation also raises **ethical issues** as some people think it can lead to **selection** of **preferred characteristics** such as gender and eye colour. **L11: Adrenaline** is released in response to **stressful** or **scary** situations. The brain detects fear or stress and sends a **nervous impulse** to the **adrenal glands** which respond by releasing **adrenaline.** It gets the body ready for **fight or flight** by triggering mechanisms that **increase** the **supply** of **oxygen** and **glucose** to **cells** in the **brain** and **muscles**, an example is **increasing heart rate**. Thyroxine plays an important role in **regulating basal metabolic rate**, the **speed** at which **chemical reactions** in the body occur while the body is at **rest.** Thyroxine is also important for many processes in the body such as **stimulating protein synthesise** for **growth** and **development.** Thyroxine is released in response to **thyroid-stimulating hormone** (TSH) which is released from the **piturity gland.** A **negative feedback system** keeps the amount of thyroxine in the blood at the right levels, when the level of thyroxine in the blood is **higher** than normal, the **secretion** of **TSH** from the piturity gland is **inhibited**. This **reduces** the amount of **thyroxine** released from the thyroid gland, so the level in the blood falls back to **normal.**	