Meden School Curriculum Planning							
Subject	Biology (Triple)	**Year Group**	10	**Sequence No.**	1	**Topic**	B1: Cells

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!'
KS3 Learning **<u>Year 7</u>** <u>Organisms & Body Systems topic</u> Basic cells, tissues, organs, organ systems and organisms. <u>Reproduction topic</u> Introduced to the structure of egg and sperm cells. **<u>Year 8</u>** <u>Plant Structure and Reproduction topic</u> Students should know the structure of a leaf in cross section, identifying the layers of tissue <u>Microbes topic</u> That a microbe can be a bacteria, virus or fungus. <u>Digestion topic</u> The Villi structures in the small intestine is only one cell thick so there is a short	**L1 – Animal Cells** Living things are made of cells. Different parts of a cell are called subcellular structures. **Nucleus:** contains genetic material and controls the activity of the cell. **Cytoplasm:** gel-like substance where most of the chemical reactions happen, it contains enzymes that control the chemical reactions. **Cell membrane:** hold the cell together and controls what goes in and out. **Mitochondria:** these are where most of the reactions for aerobic reactions take place, respiration transfers energy that the cell needs to work. **Ribosomes:** these are where proteins are made. **L2 – Plant Cells** Plant cells have extra subcellular structures. **Cell wall:** made of cellulose, supports the cell and strengthens it. **Vacuole:** contains cell sap, a weak solution of sugar and salts. **Chloroplasts:** where photosynthesis occurs which makes food for the plant. Contain **chlorophyll** which absorbs the light needed for photosynthesis. **L3 – Eukaryotic vs. Prokaryotic** **Eukaryotic cells** include **animal, plant** and **fungi** cells. **Prokaryotic cells** include **bacterial** cells. **Prokaryotic** cells do NOT contain a **nucleus** they contain a **nucleoid**. They do contain r**ibosomes, cell membrane, cell wall and cytoplasm**. Some **Prokaryotic** cells also contain other structures called: **plasmids, pilli, flagellum, slime capsules**. Misconception to address – Bacteria is plural, bacterium is singular, bacterial is caused by bacteria. Prokaryotic cells come in many different shapes and sizes, and you need microscopes to be able to see them.	L2 – Should we use embryos to cure diseases? Talk to students about the ethical and moral considerations around using embryonic stem cells in science.

diffusion pathway. There are also many blood capillaries so a concentration gradient is maintained. **<u>Year 9</u>** The different organisation of cells, tissues, organs, organ systems and organisms. The organelles within prokaryotic and eukaryotic cells. Examples of eukaryotic and prokaryotic cells. Conversion units and calculations of magnification within cell measurements. Biological drawings and uses of microscopes. Transport within cells including, diffusion, osmosis and active transport.	**L4 – Conversions & Magnification** Scientists use different **units** when **measuring** objects of different sizes. To **convert** between the **units** is a **skill** needed. **(Largest) ---------- (Smallest)** **Meter (m), Millimeter (mm), Micrometer (um) and nanometer (nm)** To get smaller you **x1000** to get larger you **÷1000** To work out the size of cells the **formula** for **magnification** must be used. **Magnification = Image size ÷ actual size** A step-by-step method of the formula is to be used and if the image size and actual size are in different units' skills from L5 need to be applied. **L5 – Magnification Calculations** **L6 & L7 -- Required Practical: Observing Cells** Identify and label the parts of a **light microscope**: **objective Lense, eyepiece, stage, stag clips, coarse focus, fine focus, light, arm, tube and base.** **The differences between an electron microscope and light microscope.** **Preparation of a slide:** Add a drop of water to a clean slide. Cut up an onion and take off one layer of epidermal tissue. Place the sample in the water on the slide. Add a drop of iodine to the slide. Place a cover slip on the sample and remove air bubbles. Place the slide under the microscope to observe and draw. **L8 - Specialised Cells** **Differentiation** is the process by which cells change to become **specialized**. Cells develop different **subcellular structures** to carry out specific functions. Most **differentiation** occurs as an **organism** develops in the early stages. Plant cells can **differentiate** their entire throughout their entire lifespan. Cells that **differentiate** in animals are mainly used for repairing and replacing cells. Undifferentiated cells are stem cells. Examples of differentiated cells are: **sperm cell, nerve cell, blood cells, root hair cell, muscle cells.** **L9 – Mitosis** Every cell in your body (apart from **red blood cells**) have a **nucleus**. The **nucleus** contains **genetic material** in the form of **chromosomes**.**Chromosomes** are coiled lengths of **DNA**. Body cells have **23 pairs**	

	of c**hromosomes 46 chromosomes** in total. Body cells in **multicellular organism**s divide to make new cells in a process called the **cell cycle**. The stage of the cycle where the cell divides is called **mitosis**. The process of **mitosis** involves: 1. The cell grows and increases subcellular structures such as ribosomes and mitochondria. DNA is also copied. 2. DNA forms X-shaped chromosomes. Each arm is an exact copy. 3. Chromosomes line up along the centre of the cell. The two arms are pulled to opposite ends of the cell. Mitosis has begun. 4. The nucleus divides. 5. The cell membrane and cytoplasm divide to form two new daughter cells who are identical to each other and the parent cell. **L10 – Binary Fission** **Bacteria** multiply by simple cell division **(binary fission)** as often as once every 20 minutes if they have enough nutrients and a suitable temperature. Bacteria can be grown in a nutrient broth solution or as colonies on an agar gel plate. **Uncontaminated cultures** of microorganisms are required for investigating the action of **disinfectants** and **antibiotics.** **L11 & 12 - Required Practical: Inhibition Zones** Petri dishes and culture media must be **sterilised** before use to ensure no bacteria are present. **Inoculating loops** used to transfer microorganisms to the media must be sterilised by passing them through a flame to kill any microorganism. The lid of the Petri dish should be secured with adhesive tape and stored upside down in school laboratories, cultures should generally be **incubated** at 25°C. The diameter of a colony or cleared area is measured and then used to calculate cross-sectional areas of colonies or clear areas around colonies using πr^2. The number of bacteria in a population after a certain time can be estimated using the mean division time. Large population sizes are usually given in standard form. **L13 – Human Stem Cells** **Stem cells** can differentiate into different specialised cells. They can be found in **early human embryos** and are known as **embryonic stem cells.** **Embryonic stem cells** be used to replace faulty cells in sick people. E.g. making nerve cells for people with paralysis or insulin-producing cells for people with diabetes.	

	Therapeutic cloning is making an embryo that has the same **genes** as the patient, this means the patient won't **reject** the **stem cells** from the **embryo**. The risk of using these types of stem cells is that these **stem cells** could be infected with a **virus** that could be passed onto the patient and make them sicker. **Adult stem cells** are found in **bone marrow,** these are limited into what they can **differentiate** into e.g. **blood cells**. Plants retain stem cells throughout their life. **L14 – Plant Stem Cells** **Plant stem cells** are called **meristems**. They are found in the **roots** and **shoots**. They can **differentiate** into any type of plant cell. **L15 – Diffusion** **Diffusion** is the **net movemen**t of **particles** from a region of **higher concentration** to a region of **lower concentration. Diffusion** is a **passive process;** this means it doesn't require any additional **energy** to take place. **Factors** that can affect the rate of diffusion are **Concentration gradient, Surface area, Temperature, Size of particles, Distance.** The part of the cell controls the **movement** of **substances** into and out of the cell is the **cell membrane**. **L16 – Active Transport** **Active transpor**t is an **active** process which means it **requires additional energy** to occur. It involves the movement of **particles** from an area of **low concentration** to an area of **high concentration** against the **concentration gradient**. **Plant cells** use **active transport** in their **root hair cells** to allow them to **absorb** the **mineral ions** from the soil **against the concentration gradient**. **L17 - Osmosis** **Osmosis** is the movement of **water molecules** through a **partially permeable membrane** from an area of **high-water concentration** to an area of **low water concentration. A partially permeable membrane** is a **membrane** with tiny holes in it which allows **water** to move in both directions. **Osmosis** is a **passive process;** this means it does not require any additional **energy** to take place. **L18 & 19 –Required Practical: Osmosis** **Investigate** the effect of a range of **concentrations** of salt or sugar **solutions** on the **mass** of plant **tissue**. students should be able to: use simple compound measures of rate of water uptake use **percentages**	

	calculate percentage gain and loss of **mass** of **plant tissue**. Be able to **plot, draw** and **interpret appropriate graphs**. **L20 & L21 – Exchange Surfaces** Calculate and compare **surface area to volume ratios**. Explain the need for **exchange surfaces** and a **transport system** in **multicellular organism**s in terms of **surface area to volume ratio**. Explain how the **small intestine** and **lungs** in **mammals**, **gills** in **fish**, and the **roots** and **leaves** in **plants**, are adapted for exchanging materials. In **multicellular organisms, surfaces** and **organ systems** are **specialised** for **exchanging** materials. This is to allow sufficient **molecules** to be **transported** into and out of **cells** for the **organism's** needs. The effectiveness of an exchange surface is increased by: having a **large surface area** a **membrane** that is **thin**, to provide a **short diffusion path** (in animals) having an efficient blood supply (in animals, for gaseous exchange) being ventilated. **L22: Revision** **L23: EoTT** **L24: GPA**	