N5 MO1 **Producing New Cells** Learning Outcome Checklist

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| Lesson | MC900432651[1] | by the end of each lesson you should know about the following (including meanings of **key words**) |
| mitosis |  | * identify the sequence of events of mitosis in a diagram
* describe the sequence of events in mitosis as follows
* in between cell divisions the chromosomes are not visible
* chromosomes become visible and appear as two **identical** **chromatids** joined together
* the **nuclear membrane** disappears
* chromosomes line up along the **equator** of the cell
* **spindle** **fibres** attach to the chromosomes and pull the chromatids apart
* separated **chromatids** move to opposite poles
* nuclear membrane reforms
* cell divides into two cells with one nucleus in each
* before mitosis the chromosomes make a copy of themselves so each chromosome appears as two **identical chromatids**
* the middle of a dividing cell is called the **equator**
* **spindle fibres** attach to the chromatids and pull them apart
 |
| role of mitosis |  | * explain that mitosis provides new cells for growth and repair of lost or damaged cells
* the **chromosome** **complement** is the number of chromosomes in a cell
* **diploid** cells are cells with two sets of chromosomes
* normal body cells (that are not gametes) are diploid
* mitosis maintains the diploid chromosome complement
* in mitosis, a diploid cell produces two diploid daughter cells
 |
| stem cells |  | * **stem** **cells** in animals are **unspecialised** cells which can divide in order to self-renew.
* stem cells have the potential to become different types of **specialised** cell.
* stem cells are involved in **growth** and **repair**.
* **specialisation** of cells leads to the formation of a variety of cells
 |
| hierarchy |  | * groups of **cells** work together to make tissues
* groups of **tissues** work together to form organs
* groups of **organs** work together to form systems
* groups of **systems** work together to form an organism
* **hierarchy** exists: cells, tissues, organs, systems, organism
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N5 Biology MO2 Control and Communication Learning Outcome Checklist

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| Lesson | MC900432651[1] | by the end of each lesson you should know (including meanings of **key words**) |
| **Nervous Control - CNS** |  | * nervous system consists of **central nervous system (CNS)** and other nerves.
* CNS consists of brain and **spinal cord**.
* location of the **cerebrum**, **cerebellum** & **medulla** in the brain
* the cerebrum is responsible for mental processes e.g. memory, reasoning, conscious thought
* the cerebellum controls balance and coordination
* function of the medulla is to control rate of breathing and heart beat
 |
| **Nervous Control - Nerves** |  | * **neurons** are nerve cells and transmit **electrical signals (impulses)**
* **receptors** detect sensory input/stimuli
* there are three types: **sensory**, **inter** and **motor**.
* sensory neurons carry nerve impulses from the body’s **receptors** (in sense organs) to the CNS
* motor neurons carry nerve impulses form the CNS to the body’s **effectors** (e.g. muscles / glands)
* inter neurons carry nerve impulses and connect sensory neurons to motor neurons
* electrical impulses carry **messages** along neurons.
* where two neurons meet there is a small gap called a **synapse**
* **chemicals** transfer the messages at synapses.
 |
| **Nervous Control – reflex ac** |  | * a **reflex action** is a fast, automatic response to a stimulus
* reflex actions protect the body from damage
* a **reflex arc** is the neural pathway that controls a reflex action
* a reflex arc has the following stages
* stimulus is detected
* electrical impulse travels along the sensory neuron
* impulse passes to inter neuron in the spinal cord
* electrical impulse is passed onto a motor neuron
* motor neuron sends the electrical impulse to an effector which brings about the response
 |
| **Hormonal Control** |  | * **endocrine** **glands** release hormones into the bloodstream.
* **hormones** are proteins which function as chemical messengers.
* a **target** tissue has cells with complementary **receptor** proteins for specific hormones, so only that tissue will be affected by these hormones.
 |
| **Hormonal Control – blood glucose**  |  | * blood **glucose** regulation is achieved by the action of two hormones produced by the pancreas; **insulin** and **glucagon**
* when there is excess glucose in the blood the body can store it as **glycogen** in the liver – **insulin** is released to activate the enzymes for this reaction
* **glucagon** activates the enzymes for the conversion of glycogen back into glucose when blood glucose levels fall
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N5 Biology MO3 Reproduction Learning Outcome Checklist

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| LESSON | MC900432651[1] | by the end of each lesson you should know (including meanings of **key words**) |
| Gametes |  | * normal body cells are **diploid** (ie contain two sets of chromosomes)
* **gametes**, the sex cells are **haploid** (ie contain only one set of chromosomes)
* in mammals the gametes are **sperm** and **egg** cells
* sperm have a **head** containing the nucleus and a **tail** in order to swim to the egg
* sperm are produced in large numbers
* fewer eggs are produced and they are larger than sperm as they contain a **food store** in their cytoplasm
* in plants the male gametes are found in **pollen** grains and the female gamete are egg cells
 |
| **Reproduction in mammals** |  | * the location of the parts of the male reproductive system
* **testes** are the site of sperm production
* **sperm** **duct** is the tube carrying the sperm from the testes
* **urethra** is the tube inside the penis
* sperm is released form the **penis** during ejaculation
* the location of the parts of the female reproductive system
* the **ovaries** produce the eggs
* **oviducts** are tubes along which the eggs travel to get to the uterus
* fertilisation happens in the oviduct
* **uterus** is where a fertilised egg would develop into a baby
* **vagina** is where sperm is deposited during sexual intercourse
* **fertilisation** is the fusion of the nuclei of the two haploid gametes to produce a diploid **zygote**
* after fertilisation the zygote divides to form an **embryo**.
 |
| **Reproduction in plants** |  | * the location of the male and female reproductive parts in a flower
* **anthers** produce pollen
* **ovules** contain the eggs cells
* **ovaries** produce the ovules
* **stigma** is the top part of the female reproductive organ in a flower
* **pollination** is the transfer of pollen form anther to stigma
* **insect pollinated** flowers have bright petals, scent and a nectary
* **wind pollinated** flowers have their anthers and stigma hanging in the air and are not bright or scented
* pollen grains grow a **tube** along which the male gametes travel to reach the ovules
* **fertilisation** is the fusion of the nuclei of the two haploid gametes to produce a diploid zygote
* after fertilisation the zygote becomes an **embryo** in a seed
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N5 Biology **MO4** **Variation and Inheritance**  Learning Outcome Checklist

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| Lesson | MC900432651[1] | By the end of the lesson you should know |
| **Variation** |  | * **variation** is the differences between organisms of the same species and can be discrete or continuous
* characteristics that can be put into two or more groups show **discrete** variation
* characteristics that show discrete variation are controlled by different forms of a **single gene**
* data on characteristics that show discrete variation is presented as a bar graph
* examples of discrete variation include: human blood group, fox glove flower colour, tongue rolling ability in humans
* characteristics that cannot be put into groups but vary with values falling between two extremes show **continuous** variation
* characteristics that show continuous variation are controlled by the alleles of **more than one gene** (**polygenic inheritance**)
* data on characteristics that show continuous variation is presented as a histogram
* examples of continuous variation include: milk yield in cattle, body mass in humans, limpet shell diameter
 |
| **Inheritance** |  | * **gene** is a section of DNA that controls an inherited characteristic (or contributes to the control of a characteristic)
* **allele** is the term for the different forms of a gene
* **phenotype** is the physical characteristic that result from the inherited genes
* **genotype** is the set of genes an organism possesses
* **dominant** is the characteristic that is shown in the phenotype whether there are one or two copies of the allele present
* **recessive** is the characteristic that can be masked by the presence of the dominant allele
* when an organism possesses two of the same allele it has a **homozygous** genotype
* when an organism possesses two different alleles it has a **heterozygous** genotype
 |
| **Genetic Crosses** |  | * **P, F1** and **F2** are used in genetic crosses to represent the Parent, first and second generations in genetic crosses
* the alleles from each parent are put in a **punnet** **square** so that the possible offspring genotype can be predicted
* predicted phenotype ratios among offspring are not always the same as the actual ratios because the **process of fertilisation is random**
* family trees can be made to trace a particular trait through several generations
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N5 Biology **MO5** **Transport Systems – Plants** Learning Outcome Checklist

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| lesson | MC900432651[1] | by the end of each lesson you should know about the following (including meanings of **key words**) |
| plant organs |  | * plant’s, like animals, have organs made up of tissues
* plant organs include **roots**, **stems** and **leaves**
* location of the tissues in a leaf structure diagram
* **upper** **epidermis** is a protective layer of cells on the top of a leaf, they are transparent to let light through
* **palisade mesophyll** is a layer of tightly packed cells, these cells are full of chloroplasts to carry out photosynthesis
* **spongy mesophyll** is a layer of loosely packed cells, the air spaces allow CO2 and O2 to diffuse; these cells are full of chloroplasts to carry out photosynthesis
* **vein** consists of xylem and phloem (for water and sugar transport)
* **lower epidermis** is the protective layer of cells on the underside of a leaf
* **guard cells** are a pair of cells that change shape to control the opening and closing of the stoma
* **stomata** are pores in the leaf surface (usually on the lower epidermis) allowing gas exchange (CO2 in, & water vapour and O2 out)
 |
| water transport |  | * water transport in a plant involves roots, stems and leaves
* Water and minerals enter the plant through the root hairs
* **root hair cells** have projections that increase the **surface area** for absorption of water by osmosis
* water and minerals are transported up through stems in **xylem** vessels to the leaves.
* xylem vessels are made of dead cells whose end walls have disintegrated to form **hollow tubes**
* xylem vessels are strengthened by rings or spirals of **lignin**
 |
| transpiration |  | * **transpiration** is the evaporation of water from the leaves of a plant
* most transpiration occurs through **stomata**
* **transpiration stream** is the flow of water from root->stem->leaf
* water enters the root hair cells by **osmosis**, flows up the xylem, moves by osmosis into the leaf cells, **evaporates** into the air spaces in the spongy mesophyll layer and is lost from the leaves by **transpiration**
* the higher the **wind speed, temperature** and **surface area** the higher the rate of transpiration
* the higher the **humidity** the lower the rate of transpiration
 |
| sugar transport |  | * sugar (made by photosynthesis) is transported up and down the plant in **phloem**.
* phloem tissue is made of living cells – **sieve tubes** and **companion cells**
* sieve tube cells allow the continuous flow of their cytoplasm so sugar can move from cell to cell, but they lack nulcei
* companion cells control the activity of sieve tube cells
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N5 Biology MO6 **Transport Systems – Animals** Learning Outcome Checklist

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| Lesson | MC900432651[1] | by the end of each lesson you should know about the following (including meanings of **key words**) |
| **blood**  |  | * in mammals the blood contains **plasma**, **red blood cells** and **white blood cells**.
* the cells are carried in the liquid plasma
* blood transports **nutrients, oxygen** and **carbon dioxide**.
 |
| red blood cells |  | * red blood cells are very small and specialised to **transport oxygen**
* red blood cells are **biconcave** in shape which presents a large surface area for the uptake of oxygen
* red blood cells have **no nucleus** making more room for haemoglobin
* red blood cells contain **haemoglobin**
* haemoglobin picks up oxygen in the lungs and forms **oxyhaemoglobin**
* in respiring tissues oxyhaemoglobin releases the oxygen
 |
| white blood cells |  | * **white blood cells** are part of the **immune system** and are involved in destroying pathogens.
* **pathogens** are microorganisms that cause disease
* there are two main types of white blood cells – **phagocytes** & **lymphocytes**.
* phagocytes carry out a process called **phagocytosis** in which they engulf pathogens.
* some lymphocytes produce Y shaped proteins called **antibodies** which destroy pathogens.
* **specific** antibodies are produced for a particular pathogen.
 |
| heart |  | * the heart is a **muscular pump** that keep blood flowing round the body
* the heart has **four chambers,** right and left **atrium** at the top, right and left **ventricle** at the bottom
* the right side of the heart receives **deoxygenated** blood from the body in the **vena** **cava** (main vein) and pumps it to the lungs via the **pulmonary artery**
* the left side of the heart receives **oxygenated** blood from the lungs in the **pulmonary vein** and pumps it to the body via the **aorta** (main artery)
* the **muscle of the left ventricle is** **thicker** than the muscle of the right ventricle because the left ventricle **generates a greater force** to pump blood to the whole body not just to the lungs
* the heart muscle receives its blood supply from the **coronary** **artery**
* there are four **valves** in the heart that prevent the blood flowing back to the chamber it came from
* location of all parts of the **heart on a diagram**
 |
| blood vessels |  | * **arteries** have **thick, muscular walls,** a **narrow central channel** and carry blood under **high pressure** **away** from the heart.
* **veins** have **thinner** **walls**, a **wider channel** and carry blood under **low pressure back** towards the heart. Veins contain **valves** to prevent backflow of blood.
* **capillaries** are **thin walled** and have a **large surface area**, forming networks at tissues and organs to allow efficient **exchange of materials**.
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N5 Biology **MO7** **Absorption of Materials** Learning Outcome Checklist

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| lesson | MC900432651[1] | by the end of each lesson you should know about the following (including meanings of **key words**) |
| absorption of materials |  | * **oxygen** and **nutrients** from food must be **absorbed** into the bloodstream to be delivered to cells for **respiration**.
* **waste materials**, such as carbon dioxide, must be **removed** from cells into the bloodstream.
* surfaces involved in the absorption of materials have certain features in common: **large surface area**, **thin walls,** **extensive blood supply**.
* these features increase the **efficiency** of absorption.
 |
| capillary networks |  | * **tissues** contain capillary networks to allow the exchange of materials at **cellular** level
* capillaries have **thin walls** to allow efficient diffusion
* the **network of capillaries** ensures all cells are close to the blood supply
 |
| lungs |  | * **lungs** are **gas exchange** organs, allowing blood and air to come close for **oxygen** to diffuse into the blood from the lungs and **carbon** **dioxide** to diffuse out of the blood into the lungs
* in the lungs, at the end of the airways there are many **alveoli** providing a large surface area.
* the alveoli have a rich supply of blood capillaries
* **oxygen** diffuses across the thin alveolar walls into the many blood capillaries.
* **carbon dioxide** diffuses into the alveoli across the thin alveolar wall from the many blood capillaries
 |
| small intestines |  | * in the digestive system, large food molecules are broken down to small soluble molecules
* starch is broken down into **glucose**; proteins are broken down into **amino acids**; fats are broken down into **fatty acids and glycerol**
* the small intestine contains finger-like projections called **villi**
* the end products of digestion from food are absorbed into the villi
* the villi provide **a large surface area for absorption**, **their walls are only one cell thick**
* each villus is closely associated with a network of **capillaries to absorb glucose and amino acids** and a **lacteal to absorb fatty acids and glycerol.**
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