

Aldenham School

IGCSE Biology – Revision Guide

Amended 02/2013

Specification

**Biology**

**Triple Award - ALL Sections**

**Double Award (4SCO) – Omit blue BOLD sentences**

**Chapter 1: Life Processes**

• Living organisms share the following basic characteristics

* they require **nutrition**
* they **respire**
* they **excrete** their waste
* they **respond** to their surroundings
* they **move**
* they **control** their internal conditions
* they **reproduce**
* they **grow** and develop.

**Cell structure**

• Draw cell structures, including the **nucleus, cytoplasm, cell membrane, cell wall, chloroplast** and **vacuole**

• Describe the **functions** of the nucleus, cytoplasm, cell membrane, cell wall, chloroplast and vacuole

• Describe the **differences** between **plant** and **animal cells.**

**Movement of substances into and out of cells**

• Define **diffusion, osmosis** and **active transport**

• Describe the movement of substances into and out of cells by **diffusion,**

**osmosis** and **active transport**

**• Define the term turgid and understand the importance in plants of turgidity as a means of support**

• Describe how **surface area to volume ratio, temperature** and **concentration** **gradient** affect the **rate** of movement of substances into and out of cells

**Respiration**

• The process of respiration releases energy in living organisms

• Describe the differences between **aerobic** and **anaerobic** respiration

• State the **word equation** and the **balanced chemical symbol equation** for aerobic respiration

• State the **word equation** for anaerobic respiration **in plants and animals**

**Key Words:**

* + excretion
	+ organelles
	+ cytoplasm
	+ nucleus
	+ selectively permeable membrane
	+ mitochondrion
	+ cellulose cell wall
	+ vacuole
	+ chloroplast
	+ enzyme
	+ substrate
	+ optimum
	+ denatured
	+ aerobic respiration
	+ anaerobic respiration
	+ diffusion
	+ active transport
	+ osmosis
	+ mitosis
	+ tissue
	+ organ
	+ organ systems:
		- endocrine
		- respiratory
		- excretory
		- circulatory
		- reproductive
		- nervous system
		- digestive

**Chapter 2: The Variety of Living Organisms**

• Describe the levels of organisation within organisms: **organelles, cells, tissues,**

**organs and systems.**

• There is a wide variety of living organisms and biology **classifies** organisms on the basis of their **structure** and how they **function**

• Describe the common features shared by organisms within the five main groups,

**plants, animals, fungi, bacteria and viruses**, and for each group describe examples and their features (below)

**Plants**: These are multicellular organisms; they **contain chloroplasts** and are able to carry out photosynthesis; they have **cellulose** cell walls; they store carbohydrates as **starch or sucrose**.

Examples include flowering plants, such as a **cereal** (e.g. maize) and a herbaceous

**legume** (e.g. peas or beans).

**Animals**: These are multicellular organisms; they do **not** contain chloroplasts and

are not able to carry out photosynthesis; they have **no cell walls**; they usually have

**nervous coordination** and are able to move from one place to another; they often

store carbohydrate as **glycogen**.

Examples include mammals (e.g. **humans**) and insects (e.g. **housefly**).

**Fungi**: These are organisms that are **not** able to carry out photosynthesis; their body

is usually organised into a **mycelium** made from thread like structures called **hyphae,** which contain **many nuclei**; some examples are single-celled; they have cell **walls** made of **chitin**; they feed by **extracellular secretion of digestive enzymes** onto food and absorption of the organic products; this is known as **saprotrophic nutrition**; they may store carbohydrate as **glycogen**.

Examples include ***Mucor*,** which has the typical fungal hyphal structure, and **yeast**

which is single-celled.

**Bacteria**: These are microscopic single celled organisms; they have a simple cell

structure that **lacks a nucleus** but contains a **circular chromosome of DNA**; some

bacteria can carry out photosynthesis but most feed off other living or dead

organisms.

Examples include ***Lactobacillus bulgaricus***, a rod shaped bacterium used in the

production of yoghurt from milk, and ***Pneumococcus***, a spherical pathogen that causes pneumonia.

**Viruses**: These are small particles, smaller than bacteria; they are parasitic and can

only reproduce inside living cells; they infect every type of living organism. They have a wide variety of shapes and sizes; they have no cellular structure but have a **protein coat** and contain one type of nucleic acid, either **DNA or RNA**.

Examples include the **tobacco mosaic virus** that causes discolouring of the leaves of tobacco plants by preventing the formation of chloroplasts, and the **influenza virus** that causes ‘flu’ in humans.

Define the term ‘**pathogen**’ and know that pathogens may be **fungi, bacteria, protoctists** or **viruses.**

**Key Words:**

* kingdom
* multicellular
* starch
* invertebrate
* vertebrate
* unicellular
* hyphae
* mycelium
* saprotrophic
* flagella
* plasmid
* decomposer
* pathogen
* parasite
* Fungi
* Mould
* Bacteria
* Virus

**Chapter 3: Breathing and Gas Exchange**

• On a diagram be able to label the structure of the thorax, including the **ribs, intercostal muscles, diaphragm, trachea, bronchi, bronchioles, alveoli** and **pleural membranes**

• Describe the role of the **intercostal muscles** and the **diaphragm**, during breathing

• Explain how **alveoli** are adapted for gas exchange by **diffusion** between air in the

lungs and blood in capillaries

• State the biological consequences of **smoking** in relation to the lungs and the

circulatory system

**Key Words:**

* ventilation
* gas exchange
* inhalation
* exhalation
* thorax
* diaphragm
* intercostal muscles
* trachea
* bronchus
* alveoli
* cartilage
* pleural layers
* cilia
* mucus
* bronchitis
* emphysema
* nicotine
* carcinogen
* carbon monoxide
* carboxyhaemoglobin
* addictive

**Chapter 4: Food and Digestion**

• State the chemical **elements** present in **carbohydrates, proteins** and **lipids**

• Describe the structure of carbohydrates, proteins and lipids as large molecules

made up from smaller basic units: **starch and glycogen from simple sugars; protein from amino acids; lipid from fatty acids and glycerol**

**• State that a balanced diet should include appropriate proportions of carbohydrate, protein, lipid, vitamins, minerals, water and dietary fibre**

• Describe the functions of carbohydrate, protein, lipid, vitamins A, C and D, and the mineral ions calcium and iron, water and dietary fibre

**• Understand that energy requirements vary with activity levels, age and pregnancy**

•Identify on a diagram the structures of the **human alimentary canal**

•Describe the functions of the **mouth, oesophagus, stomach, small intestine, large intestine,** and **pancreas.**

• Describe the processes of **ingestion, digestion, absorption, assimilation** and

**egestion.**

• Explain how and why food is moved through the gut by **peristalsis**

• Describe the role of digestive enzymes to include the digestion of **starch to**

**glucose by amylase and maltase**, the digestion of **proteins to amino acids by**

**proteases** and the digestion of **lipids to fatty acids and glycerol by lipases**

• Recall that **bile** is produced by the **liver** and stored in the **gall bladder**

•Describe the role of bile in **neutralising stomach acid** and **emulsifying lipids**

• Explain how the structure of a **villus** helps **absorption** of the products of digestion in the **small intestine**

**Key Words:**

* carbohydrate
* lipid
* protein
* minerals
* vitamins
* fibre
* polymer
* glycogen
* amino acid
* pepsin
* iodine solution
* Benedict’s solution
* Biuret test
* saturated
* cholesterol
* Kwashiorkor
* deficiency
* rickets
* anaemia
* scurvy
* kilojoule
* digestion
* chemical
* mechanical
* peristalsis
* pancreas
* oesophagus
* saliva
* sphincter muscle
* liver
* gall bladder
* bile
* absorption
* villi
* lacteal
* faeces
* egestion

**Chapter 5: Blood and Circulation**

• State why simple, **unicellular organisms** can **rely on diffusion** for movement of substances in and out of the cell

• understand the **need** for a transport system in **multicellular organisms**.

• State the **composition of the blood**

•Describe the role of **plasma** in the transport of carbon dioxide, digested food,

urea, hormones and heat energy

• Describe the **adaptations** of **red blood cells** for the transport of oxygen, including

**shape, structure and the presence of haemoglobin**

• Describe how the **immune system** responds to disease using **white blood cells**, illustrated by **phagocytes** **ingesting pathogens** and **lymphocytes** releasing **antibodies** specific to the pathogen

**• State that vaccination results in the manufacture of memory cells, which enables future antibody production to the pathogen to occur sooner, faster and in greater quantity**

**• Describe how platelets are involved in blood clotting, which prevents blood loss and the entry of microorganisms**

• Describe the structure of the **heart** and how it functions

• State how the **heart rate** changes during **exercise** and under the influence of

**adrenaline**

• Describe the **structure** of **arteries, veins** and **capillaries** and understand their roles

• Recall the general plan of the circulation system to include the **blood vessels** to and from the **heart**, the **lungs**, the **liver** and the **kidneys**

**Key Words:**

* circulatory system
* double circulation
* pulmonary circulation
* systemic circulation
* hepatic
* renal
* vena cava
* aorta
* cardiac
* atrio-ventricular
* diastole
* systole
* coronary circulation
* medulla
* artery
* vein
* capillary
* plasma
* lymphocyte
* phagocyte
* platelet
* haemoglobin
* antibody
* fibrinogen

**Chapter 6: Coordination**

• Describe how responses can be controlled by **nervous** or by **hormonal**

**Communication**

•Define the **differences** between the two systems

• State that the **central nervous system** consists of the **brain** and **spinal cord** and is linked to sense organs by **nerves**

• Understand that stimulation of **receptors** in the **sense organs** sends **electrical**

**impulses** along **nerves** into and out of the central nervous system, resulting in rapid

responses

• Describe the **structure** and **functioning** of a simple **reflex arc**, using the example of **withdrawal of a finger from a hot object**

• Describe the structure and function of the **eye as a receptor**

**• Understand the function of the eye in focusing near and distant objects, and in responding to changes in light intensity**

**Key Words:**

* stimulus
* response
* coordination
* effector
* impulse
* transducer
* neurone
* CNS
* dendrons
* dendrites
* synapses
* myelin
* sclera
* cornea
* pupil
* choroid
* retina
* optic nerve
* fovea
* refracted
* dilation
* accommodation
* ciliary muscle
* reflex arc
* dorsal root
* ventral root
* voluntary action
* neurotransmitter
* cerebrum
* cerebral hemispheres
* cerebellum
* medulla

**Chapter 7: Chemical Coordination**

•State the sources (where they are produced), roles (what they do) and effects (what changes they cause) of the following hormones:

**ADH, adrenaline, insulin, testosterone, progesterone** and **oestrogen.**

* hypothalamus
* pituitary gland
* hormone
* endocrine system
* gland
* exocrine
* endocrine
* follicle stimulating hormone
* luteinising hormone
* anti-diuretic hormone
* thyroxin
* adrenaline
* oestrogen
* progesterone
* testosterone
* pancreas
* testes
* ovaries
* glycogen
* glucagon
* insulin
* diabetes

**Chapter 8: Homeostasis and Excretion**

• State that the **lungs, kidneys** and **skin** are organs of **excretion**

• Understand how the **kidney** carries out its roles of **excretion** and **osmoregulation**

• Describe the structure of the **urinary system**, including the **kidneys, ureters**, **bladder** and **urethra**

• Be able to label the structure of a **nephron**, to include **Bowman’s capsule** and **glomerulus,** **convoluted tubules, loop of Henlé** and **collecting duct**

• Describe **ultrafiltration** in the Bowman’s capsule and the **composition of the**

**glomerular filtrate**

• State that water is **reabsorbed** into the blood from the **collecting duct**

• State that **selective reabsorption** of **glucose** occurs at the **proximal**

**convoluted tubule**

• Describe the role of **ADH** in regulating the water content of the blood

• Recall that **urine** contains **water, urea** and **salts.**

**• Describe the role of the skin in temperature regulation, with reference to**

**sweating, vasoconstriction and vasodilation**

**Key Words:**

* excretion
* homeostasis
* tissue fluid
* urea
* urine
* nitrogenous waste
* kidney
* ureter
* urethra
* renal
* bladder
* sphincter
* cortex
* medulla
* nephron
* tubule
* pelvis
* Bowman’s capsule
* glomerulus
* basement membrane
* ultrafiltration
* loop of Henle
* ADH
* homeothermic
* endotherm
* thermoregulatory
* epidermis
* hypodermis
* sweat gland
* vaporisation
* vasodilation
* vasoconstriction

**Chapter 9: Reproduction in Humans**

• Identify the **structures** and state the **functions** of the male and female **reproductive systems**

• State the roles of **oestrogen** and **progesterone** in the **menstrual cycle**

**• Describe the role of the placenta in the nutrition of the developing embryo**

**• Understand how the developing embryo is protected by amniotic fluid**

• State the roles of **oestrogen** and **testosterone** in the development of **secondary sexual characteristics.**

**KeyWords:**

* gametes
* fertilisation
* zygote
* ovaries
* testes
* chromosome
* homologous pair
* haploid
* diploid
* meiosis
* semen
* implantation
* embryo
* placenta
* amnion
* foetus
* cervix
* uterus
* vagina
* fallopian tube
* urethra
* scrotum
* seminal vesicle
* puberty
* FSH
* LH
* testosterone
* oestrogen
* ovulation
* follicle
* corpus luteum
* progesterone

**Chapter 10: Plants and Food**

• Describe the process of **photosynthesis** and understand its importance in

**conversion** of **light energy** to **chemical energy**

• State the **word equation** and the **balanced chemical symbol equation** for

photosynthesis

• Describe how **carbon dioxide concentration**, **light intensity** and **temperature** affect the rate of photosynthesis

• Explain how the **structure** of the **leaf** is **adapted** for **photosynthesis**

• State that plants require **mineral ions** for growth and that **magnesium ions** are

needed for **chlorophyll** and **nitrate ions** are needed for **amino acids**

• Describe how **gas is exchanged** (carbon dioxide and oxygen) in relation to **respiration and photosynthesis**

**• understand that respiration continues during the day and night, but that the**

**net exchange of carbon dioxide and oxygen depends on the intensity of light**

• Explain how the **structure** of the **leaf** is **adapted** for **gas exchange**

• Describe the role of **stomata** in gas exchange

• Recall the origin of **carbon dioxide and oxygen** as waste products of metabolism

and their **loss from the stomata of a leaf**.

**Key Words:**

* starch
* chlorophyll
* photosynthesis
* cuticle
* epidermis
* stomata
* mesophyll
* palisade layer
* xylem
* phloem
* limiting factor
* nitrate
* phosphate
* potassium
* magnesium

**Chapter 11: Transport in Plants**

 • Describe the position of **phloem** and **xylem** in a **stem**

**• Describe the role of phloem in transporting sucrose and amino acids between the leaves and other parts of the plant**

• Describe the role of the **xylem** in transporting **water** and **mineral salts** from the **roots** to other parts of the plant

• Explain how water is absorbed by **root hair cells** (draw a root hair cell)

• State that **transpiration** is the **evaporation of water** from the surface of a plant

• Explain how the **rate of transpiration** is affected by changes in **humidity, wind**

**speed, temperature** and **light intensity**

**Key Words:**

* osmosis
* partially permeable membrane
* water potential
* turgid
* flaccid
* plasmolysed
* turgor
* wilt
* transpiration
* lumen
* lignin
* sieve plate
* sieve tube
* companion cell
* vascular bundle
* potometer
* mineral ion
* active transport

**Chapter 12: Chemical Coordination in Plants**

• State that plants respond to **stimuli**

• Describe the **geotropic responses** of **roots** and **stems**

• Describe **positive phototropism** of **stems**

• Describe how **phototropic responses** in stems are the result of differential

growth caused by **auxin**

**Key words:**

•Tropism

•Directional growth

•Stimulus

•Response

•Phototropic

•Geotropic

•Hydrotropic

•Auxin

**Chapter 13: Reproduction in Plants**

• Describe the differences between **sexual** and **asexual reproduction**

• State that **fertilisation** involves the **fusion** of a male **and female gamete** to

produce a **zygote** that undergoes **cell division** and develops into an **embryo**.

• Describe the **structures** of an **insect-pollinated** and a **wind-pollinated** flower

•Explain how each is **adapted** for **pollination**

• Understand that the **growth** of the **pollen tube** followed by **fertilisation** leads to **seed** and **fruit** formation

**• Recall the conditions needed for seed germination**

**• Understand how germinating seeds utilise food reserves until the seedling can carry out photosynthesis**

• State that plants can reproduce **asexually** by natural methods (**runners**), and by artificial methods (**cuttings**).

**Key Words:**

* asexual reproduction
* cuttings
* pollen
* ova
* pollination
* fertilisation
* seed
* anther
* stamen
* carpel
* stigma
* style
* radicle
* plumule
* cotyledon
* endosperm
* testa
* germination
* fruit
* dispersal
* dicotyledon
* monocotyledon
* dormant

**Chapter 14: Ecosystems**

• Define the terms **population, community, habitat** and **ecosystem**

• Recall the use of **Quadrats** to estimate the **population size** of an organism in **two different areas**

•Describe the use of Quadrats for sampling the **distribution of organisms** in their habitats

• State the names given to different **trophic** levels to include **producers, primary,**

**secondary** and **tertiary consumers** and **decomposers**

• Describe the concepts of **food chains**, food **webs, pyramids of number, pyramids of biomass** and **pyramids of energy transfer**

• Understand the transfer of **substances** and of **energy** along a food chain

• Explain why only about **10% of energy** is transferred from one trophic level to

the next.

**• Describe the stages in the water cycle, including evaporation, transpiration,**

**condensation and precipitation**

• Describe the stages in the **carbon cycle**, including **respiration, photosynthesis,**

**decomposition** and **combustion**

**• Describe the stages in the nitrogen cycle, including the roles of nitrogen**

**fixing bacteria, decomposers, nitrifying bacteria and denitrifying bacteria**

**(specific names of bacteria are not required).**

**Key Words:**

* producer
* consumer
* decomposer
* environment
* ecosystem
* habitat
* population
* biome
* quadrat
* trophic level
* carnivore
* herbivore
* food web
* biomass
* fossilisation
* combustion
* assimilation
* nitrification
* ammonia
* nitrate
* denitrification
* nitrogen-fixing
* nodule
* mutualism
* precipitation
* transpiration

**Chapter 15: Human Influences on the Environment**

• State the **biological consequences** of pollution of air by **sulphur dioxide** and by **carbon monoxide**

• Recall that **water vapour, carbon dioxide, nitrous oxide, methane** and **CFCs** are

**greenhouse gases**

• Describe how **human activities** contribute to **greenhouse gases**

• Describe how an **increase** in greenhouse gases results in an enhanced

**greenhouse effect**, this may lead to **global warming** and its consequences (state the consequences of global warming)

**• Understand the biological consequences of pollution of water by sewage including increases in the number of microorganisms causing depletion of oxygen**

• State that **eutrophication** (describe eutrophication) can result from **leached minerals** from **fertiliser**

• State the effects of **deforestation**, including **leaching, soil erosion, disturbance**

**of the water cycle** and how deforestation changes the balance in atmospheric **oxygen** and **carbon dioxide**

• Describe how **glasshouses** and **polythene tunnels** can be used to increase the **yield** of certain crops

• Describe the effects on crop yield of **increased carbon dioxide** and increased

**temperature** in glasshouses

• Describe the use of **fertiliser** to increase crop **yield**

• Explain the reasons for **pest** control

•Describe the **advantages** and **disadvantages** of using **pesticides** and **biological control** with crop plants.

**Key Words:**

* pollution
* carbon dioxide
* global warming
* greenhouse effect
* sulphur dioxide
* acid rain
* deforestation
* lichen
* indicator
* nitrogen oxides
* leaching
* eutrophication
* anoxic
* yield
* fertiliser
* pesticide
* organic
* biological control
* mutation
* monoculture
* crop rotation
* overgrazing
* desertification
* bioaccumulation
* biomagnification

**Chapter 16: Chromosomes, Genes and DNA**

•Recall that the **nucleus** of a cell contains **chromosomes** on which **genes** are located

• State that a **gene** is a **section** of a molecule of **DNA**

• Describe a **DNA molecule** as two strands coiled to form a **double helix**, the strands being linked by a series of paired bases: **adenine (A) with thymine (T),** and **cytosine (C) with guanine (G)**

• Understand that **genes** exist in **alternative forms** called **alleles** which give rise to

**differences** in inherited characteristics

**Chapter 17: Cell Division**

• Describe the division of a **diploid** cell by **mitosis** to produce two cells which contain **genetically identical** sets of chromosomes

• Understand that **mitosis** occurs during **growth, repair, cloning** and **asexual reproduction**

•Understand that division of a cell by **meiosis** produces **four cells**, each with **half** the number of **chromosomes**, and that this results in the formation of **genetically**

**different haploid gametes**

• State that **random** fertilisation produces **genetic variation** of offspring

• Recall that in **human** cells the **diploid** number of chromosomes is **46** and the **haploid** number is **23**

• Understand that **variation** within a species can be **genetic, environmental, or a**

**combination of both**

**Key Words:**

* haploid
* diploid
* meiosis
* mitosis
* prophase
* metaphase
* anaphase
* telophase
* spindle
* variation
* monozygotic twins
* fraternal twins
* clone
* environmental factors

**Chapter 18: Genes and Inheritance**

• Understand that **genes** exist in alternative forms called **alleles** which give rise to

**differences** in inherited characteristics

• State the meaning of **dominant, recessive, homozygous, heterozygous,**

**phenotype, genotype** **and codominance**

• Describe patterns of **inheritance** using a **genetic diagram** (PUNNETT SQUARE)

• Understand how to interpret **family pedigrees**

• Predict **probabilities** of outcomes from **genetic crosses**

• Recall that the **sex** of a person is controlled by one pair of chromosomes, **XX in a**

**female and XY in a male**

• Describe the determination of the **sex of offspring at fertilisation**, using a **genetic**

**diagram**

**Key words:**

* Mendel
* gene
* allele
* inheritance
* F1/F2
* genotype
* phenotype
* dominant
* recessive
* test cross
* pedigree
* codominance
* dominant
* evolution
* natural selection
* species
* selection pressure
* selective advantage
* sickle cell anaemia
* homozygous
* heterozygous
* extinction

**Chapter 19: Natural Selection and Evolution**

• Recall that **mutation** is a **rare, random change** in **genetic material** that can be

inherited

• Describe the process of **evolution** by means of **natural selection**

• Understand that many **mutations** are **harmful** but some are **neutral** and a few are

**beneficial**

• Describe how **resistance** to **antibiotics** can increase in **bacterial populations**

**• Understand that the incidence of mutations can be increased by exposure to**

**ionising radiation (e.g. gamma rays, X-rays and ultraviolet rays) and some chemical mutagens (e.g. chemicals in tobacco).**

**Key Words:**

•Natural Selection

•Selection pressure

•Selective advantage

•Evolution

•Variation

•Peppered moth

•Antibiotic resistance

•Mutation

**Chapter 20: Selective Breeding**

• Describe how **plants** with desired characteristics can be developed by **selective**

**breeding** (use the example of **increased yield** and **reduction** of **stem length** in **wheat**)

• Describe how **animals** with desired characteristics can be developed by **selective**

**breeding** (use the example of **increased yield** of **meat** and **milk in cattle**).

• Describe the process of **micropropagation** (tissue culture) in which small pieces of

plants (**explants**) are grown *in vitro* using nutrient media

• Understand how micropropagation can be used to produce **commercial quantities** of identical plants (**clones**) with **desirable characteristics**

• Describe the **stages** in the production of **cloned mammals** involving the introduction of a **diploid nucleus** from a **mature cell** into an **enucleated egg cell** (use the example of Dolly the sheep)

**• Evaluate the potential for using cloned transgenic animals, for example, to**

**produce commercial quantities of human antibodies or organs for**

**transplantation.**

**Key Words:**

* micropropagation
* transgenic
* genetically modified
* artificial selection
* selection pressure
* productivity
* artificial insemination
* clone
* breed

**Chapter 21: Using Microorganisms**

• Describe the role of **yeast** in the production of **beer**

**• Understand the role of bacteria (*Lactobacillus*) in the production of yoghurt**

• Label a diagram of an **industrial fermenter**

•Explain the need to provide **suitable conditions** in the fermenter, including **aseptic precautions, nutrients, optimum temperature** and **pH, oxygenation** and **agitation,** for the growth of microorganisms**.**

**Key Words:**

* protozoa
* algae
* fungi
* mould
* bacteria
* virus
* fermentation
* fermenter
* culture
* penicillin
* *Penicillium*
* biotechnology
* malt
* mash tun
* lactic acid bacteria
* coagulate
* homogenised
* pasteurised

**Chapter 22: Genetic Modification**

• Describe the use of **restriction enzymes** to **cut** DNA at specific sites and **ligase**

**enzymes** to **join** pieces of DNA together

• Describe how **plasmids** and **viruses** can act as **vectors**, which take up pieces

of DNA, then insert this **recombinant DNA** into other cells

• Describe how large amounts of human **insulin** can be manufactured from

**genetically modified bacteria** that are grown in a **fermenter**

• Evaluate the potential for using **genetically modified plants** (GM) to **improve** food

production (use the example of plants with improved resistance to disease)

**• Recall that the term ‘transgenic’ means the transfer of genetic material from**

**one species to a different species.**

**Key Words:**

* DNA
* gene
* transgenic
* recombinant
* genetic modification
* plasmid
* restriction endonuclease
* DNA ligase
* vector
* glucose isomerase
* bovine somatotrophin
* xenotransplant