



Year 10 Syllabus in a nutshell

BIOLOGY





Year 10 Syllabus in a nutshell - Biology

You do not need to learn results from experiments, but you must be familiar with methods and how to present the data appropriately (ie. able format and graph type).

Italics indicates sets C and G and D only.

* Indicates sets L, E, M only

Year 9 Cell Structure
Name the main organelles of plant and animal cells (eukaryotic cells)
Name the main structures of bacterial cells (prokaryotic cells)
Explain how the main sub-cellular structures, including the nucleus, cell membranes, mitochondria, cell wall and chloroplasts in plant cells and plasmids in bacterial cells are related to their functions
Describe the difference in how the genetic material is found within eukaryotic and prokaryotic cells.
Explain how the structure of different types of cell relate to their function in a tissue, an organ or organ system, or the whole organism. Including sperm cells, nerve cells and muscle cells in animals and root hair cells, xylem and phloem cells in plants.
Name the main parts of a light microscope and explain their functions
Describe the differences in magnification and resolution between electron and light microscopes
Be able to use and rearrange the formula $\text{Image} = \text{Actual} \times \text{Magnification}$
Be able to use appropriate drawing techniques to represent a cell
Year 9 Principles of organisation
Define a cell, tissue, organ and organism
Be able to discuss the digestive system (and the function of the organs) as an example of an organ system
Year 9 Animal tissues, organs and organ systems
Describe the structure function and optimum conditions for enzymes..
Define denaturation
Recall the sites of production and the action of amylase, proteases and lipases
Know that digestive enzymes convert food into small soluble molecules that can be absorbed into the bloodstream
State that the products of digestion are used to build new carbohydrates, lipids and proteins.
Some glucose is used in respiration.
Recall where bile is made and stored and its pH and function
State conditions that increase the rate of fat breakdown by lipase.
Year 9 Transport in Cells
Explain how substances may move into and out of cells across the cell membranes via diffusion Link the structure of a root hair cell to its function.
Describe diffusion
Recall that some of the substances transported in and out of cells by diffusion are oxygen and carbon dioxide in gas exchange, and of the waste product urea from cells into the blood plasma for excretion in the kidney
Describe factors the affect the rate of diffusion
Recall that a single-celled organism has a relatively large surface area to volume ratio to allow sufficient transport of molecules into and out of the cell
Explain how the small intestine and lungs in mammals, gills in fish, and the roots and leaves in plants, are adapted for exchanging materials
List factors that increase the effectiveness of an exchange surface
Describe osmosis



Recall that active transport moves substances from a more dilute solution to a more concentrated solution (against a concentration gradient). This requires energy from respiration.
Describe a use for active transport in both plants and animals.
Explain the difference between diffusion, osmosis and active transport
Explain plant mechanical defence adaptations.
Year 10 Plant hormones
<i>Explain how plants use hormones to coordinate and control growth in response to light and gravity (Biology only)</i>
<i>Describe the role of gibberellins and ethane in plants (Biology only)</i>
<i>Describe some uses of plant hormones in agriculture and horticulture (Biology only)</i>
Year 10 Photosynthesis
State the word equation for photosynthesis
Write a balanced symbol equation for photosynthesis
Explain where the energy for photosynthesis comes from
State the factors that affect the rate of photosynthesis
Explain limiting factors
Explain graphs of photosynthesis rate involving two or three factors and decide which is the limiting factor
Understand and use inverse proportion – the inverse square law and light intensity in the context of photosynthesis
Explain how limiting factors are important in the economics of enhancing the conditions in greenhouses to gain the maximum rate of photosynthesis while still maintaining profit
State the six uses of glucose by plants
Know how plant use nitrate ions that are absorbed from the soil.
Year 10 Respiration
Compare the processes of aerobic and anaerobic respiration with regard to the need for oxygen, the differing products and the relative amounts of energy transferred.
Define aerobic and anaerobic respiration
State that reactions which transfer energy to the environment are exothermic reactions
Name three things organisms need energy for State the word equation for aerobic respiration
Write a balanced symbol equation for aerobic respiration
State the word equation for anaerobic respiration in muscles
The energy transferred supplies all the energy needed for living processes.
State the word equation for anaerobic respiration in plant and yeast cells
Write a balanced symbol equation for anaerobic respiration in yeast and plant cells
State that anaerobic respiration in yeast cells is called fermentation and has economic importance in the manufacture of bread and alcoholic drinks
Explain why anaerobic respiration takes place in muscles during exercise
Explain muscle fatigue and oxygen debt
Define the role of the liver in the removal of lactic acid (HT only)
Define metabolism
The energy transferred by respiration in cells is used by the organism for the continual enzyme controlled processes of metabolism that synthesise new molecules.
State five metabolic processes
Year 10 Circulation
Recall the structure and functioning of the human heart and lungs, including how lungs are adapted for gaseous exchange
Recall that the heart is an organ that blood around the body in a double circulatory system.



The right ventricle pumps blood to the lungs where gas exchange takes place. The left ventricle pumps blood around the rest of the body.
Name the major blood vessels
Describe the structure of the lungs
Explain natural and artificial pacemakers
Name the three different types of blood vessel and explain how the structure of these vessels relates to their functions.
Describe the components of blood and who they are adapted to function
Describe coronary heart disease: a non-communicable disease
Year 9 Health issues
State that health is the state of physical and mental wellbeing.
Know that severe physical ill health can lead to depression and other mental illness.
Explain the effect of lifestyle on some non-communicable diseases and that they can be caused by and their increased by the interaction of a number of factors
Recall that benign tumours and malignant tumours result from uncontrolled cell division. Malignant tumour cells are cancers.
Know lifestyle risk factors for various types of cancer including smoking, obesity, common viruses and UV exposure. There are also genetic risk factors for some cancers.
Year 10 Plant tissues, organs and systems
Know the function of epidermal tissues palisade mesophyll, spongy mesophyll, xylem and phloem and meristem tissue
Describe the structures of tissues in the leaf and relate to their functions
Explain how root hair cells are adapted for the efficient uptake of water and mineral ions
Know the structure and function of xylem tissue.
Define factors which affect the rate of transpiration
Explain the role of stomata and guard cells
Explain the role of phloem tissue and name this process
Year 10 Adaptations, interdependence and competition
Suggest the factors for which organisms are competing in a given habitat
Suggest how organisms are adapted to the conditions in which they live
Define an ecosystem
Define interdependence
Explain what is meant by a "stable community"
Explain how a change in an abiotic factor would affect a given community
List abiotic factors
Explain how a change in a biotic factor might affect a given community
List biotic factors
Explain how organisms are adapted to live in their natural environment
Define an extremophile
Year 10 Organisation of an ecosystem
Define a producer, primary consumers, secondary consumers and tertiary consumers
Construct food chains
<i>Describe the differences between trophic levels</i>
<i>Construct pyramids of biomass</i>
<i>Explain how energy is lost between trophic levels</i>
<i>Calculate the efficiency of energy transfer between trophic levels</i>
Explain the use of transects and quadrats



Explain why, in a stable community, the numbers of predators and prey rise and fall in cycles
Explain the role of microorganisms in cycling materials through an ecosystem.
Be able to explain the Carbon cycle
<i>State factors which affect the rate of decay</i>
<i>Explain the design and purpose of a compost heap</i>
<i>Explain the design and purpose of biogas generators</i>
<i>Evaluate the impact of environmental change on species distribution</i>
Year 10 Biodiversity
Define biodiversity
Explain the importance of biodiversity
Understand the environmental impacts of an increasing human population
State the types of pollution
State the ways in which humans use the land
Explain why destruction of peat bogs is harmful
State the reasons why deforestation is occurring
Describe the biological consequences of global warming
Explain how the enhanced greenhouse effect occurs
Describe positive and negative human actions on biodiversity
Year 10 Food production
<i>Describe factors affecting levels of food production</i>
<i>Define food security</i>
<i>Describe farming techniques used to improve efficiency of food production</i>
<i>Explain why fish stocks are declining and how sustainable fishing is managed</i>
<i>Describe and explain biotechnological and agricultural solutions, including genetic modification, to the demands of the growing human population</i>
*Classification and Evolution
Describe simply that variation can be caused by genetics, environment, or a combination of both
State that there is usually variation within a population of a species
Recall that mutations occur randomly and some are beneficial to the organism
Describe evolution as a change in the inherited characteristics of a population over time through a process of natural selection
Describe the process of natural selection
Recall that all species of living things have evolved from simple life forms that first developed more than 3 billion years ago
Know the main sources of evidence of evolution
Be able to use and explain the Linnean classification system
Be able to describe the impact of developments in biology on classification systems
Be able to state the 3 domains
Be able to use an evolutionary tree to decipher ancestral relationships
Scientific skills
Be able to construct appropriate graphs (line, bar, histogram, pie chart, scatter)
Calculate mean, mode, median, range
Convert units of measurement eg. cm to mm
Interpret data on graphs
Use standard form
Calculate percentages
Calculate percentage change



Calculate surface area and volume (including as a ratio)
Understand correlation
Make estimates
Required Practicals
1 – Using a light microscope: use a light microscope to observe, draw, and label a selection of plant and animal cells and include a scale magnification.
2 – Effect of antiseptics or antibiotics on bacterial growth: use agar plates and measure the zones of inhibition produced around colonies
3 – Effect of a range of concentrations of salt or sugar solutions on the mass of plant tissues: investigating osmosis by weighing or measuring length of potato or aubergine tubes, then calculating % change
4 – Standard food tests to identify food groups: detect sugars, starch, and proteins, using Benedict's test, iodine test, and biuret reagent
5 – Investigate the effect of pH on the rate of reaction of amylase: use a continuous sampling method to determine the time taken to completely digest a starch solution at a range of pH values
6 – Effect of light intensity on rate of photosynthesis on an aquatic plant
8 – <i>Effect of light or gravity on growth of newly germinated seedlings – recording length with accurate labelled biological drawings of results</i>
9 – Measuring the population size of a common species in a habitat: use of quadrats and transects whilst measuring the effect of a particular abiotic factor