

## A summary of topics for 3<sup>rd</sup> Year iGCSE Biology

- Practical work shown in bold is included in the specification
- Teachers can also include other practical work to support their teaching

Third Year Topics		Approximate timing	Practical work
3.1	Living organisms and cells	3 weeks	<ul style="list-style-type: none"> <li>• Microscopy</li> <li>- cells and pond organisms</li> </ul>
3.2	Nutrition in humans	7 weeks	<ul style="list-style-type: none"> <li>• Rat dissection</li> <li>• <b>Energy content of foods</b></li> <li>• <b>Food tests</b></li> <li>• <b>Effect of temp. on enzyme activity</b></li> <li>• <b>Effect of pH on enzyme activity</b></li> </ul>
3.3	Respiration	6 weeks	<ul style="list-style-type: none"> <li>• <b>Carbon dioxide and heat from respiring organisms</b></li> </ul>
3.4	Gas exchange in humans		<ul style="list-style-type: none"> <li>• <b>Effect of exercise on breathing rate</b></li> </ul>
3.5	Plant nutrition	3 weeks	<ul style="list-style-type: none"> <li>• <b>Oxygen from elodea</b></li> <li>• <b>Starch tests – light, chlorophyll and CO<sub>2</sub></b></li> </ul>
3.6	Gas exchange in plants	3 weeks	<ul style="list-style-type: none"> <li>• <b>Effect of light on gas exchange in leaves</b></li> </ul>
3.7	Ecology	4 weeks	<ul style="list-style-type: none"> <li>• <b>Population study using quadrats</b></li> </ul>
	<b>Total</b>	<b>26 weeks</b>	

### 3.1 Living organisms and cells

Content detail	IGCSE Exam. Paper
<p>Understand that living organisms share the following characteristics:</p> <ul style="list-style-type: none"> <li>• they require nutrition</li> <li>• they respire</li> <li>• they excrete their waste</li> <li>• they respond to their surroundings</li> <li>• they move</li> <li>• they control their internal conditions</li> <li>• they reproduce</li> <li>• they grow and develop</li> </ul>	1 and 2
<p>Describe the levels of organisation within organisms: organelles, cells, tissues, organs and systems</p> <p>Describe cell structures, including the nucleus, cytoplasm, cell membrane, cell wall, mitochondria, chloroplast, ribosomes and vacuole</p> <p>Describe the functions of the nucleus, cytoplasm, cell membrane, cell wall, mitochondria, chloroplasts, ribosomes and vacuole</p> <p>Know the similarities and differences in the structure of plant and animal cells</p>	1 and 2
<p>Describe the common features shown by eukaryotic organisms: plants, animals, fungi and protoctists</p> <p>Plants: these are multicellular organisms; their cells contain chloroplasts and are able to carry out photosynthesis; their cells have cellulose cell walls; they store carbohydrates as starch or sucrose. Examples include flowering plants, such as a cereal (for example, maize), and a herbaceous legume (for example, peas or beans).</p> <p>Animals: these are multicellular organisms; their cells do not contain chloroplasts and are not able to carry out photosynthesis; they have no cell walls; they usually have nervous co-ordination and are able to move from one place to another; they often store carbohydrate as glycogen. Examples include mammals (for example, humans) and insects (for example, housefly and mosquito).</p> <p style="text-align: right;">(continued)</p>	1 and 2

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; their cells have walls made of chitin; they feed by extracellular secretion of digestive enzymes onto food material 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.

Protoctists: these are microscopic single-celled organisms. Some, like Amoeba, that live in pond water, have features like an animal cell, while others, like Chlorella, have chloroplasts and are more like plants. A pathogenic example is Plasmodium, responsible for causing malaria.

*Features and examples of bacteria and viruses are included in Topic 5.3*

## 3.2 Nutrition in humans

Content detail	IGCSE Exam. Paper
<p>Understand that a balanced diet should include appropriate proportions of carbohydrate, protein, lipid, vitamins, minerals, water and dietary fibre</p> <p>Identify the sources and describe the functions of carbohydrate, protein, lipid (fats and oils), vitamins A, C and D, the mineral ions calcium and iron, water and dietary fibre as components of the diet</p> <p>Understand how energy requirements vary with activity levels, age and pregnancy</p> <p>Identify the chemical elements present in carbohydrates, proteins and lipids (fats and oils)</p> <p>Describe the structure of carbohydrates, proteins and lipids as large molecules made up from smaller basic units:</p> <ul style="list-style-type: none"> <li>• starch and glycogen from simple sugars</li> <li>• protein from amino acids</li> <li>• lipid from fatty acids and glycerol</li> </ul> <p><b>Practical tasks:</b></p> <p><i>Investigate food samples for the presence of glucose, starch, protein and fat</i></p> <p><b>Investigate the energy content in a food sample</b></p>	<p>1 and 2</p> <p><b>2</b></p>
<p>Describe the structure and function of the human alimentary canal, including the mouth, oesophagus, stomach, small intestine (duodenum and ileum), large intestine (colon and rectum) and pancreas</p> <p>Understand how food is moved through the gut by peristalsis</p> <p>Understand the role of digestive enzymes including</p> <ul style="list-style-type: none"> <li>• the digestion of starch to glucose by amylase and maltase,</li> <li>• the digestion of proteins to amino acids by proteases and</li> <li>• the digestion of lipids to fatty acids and glycerol by lipases.</li> </ul>	<p>1 and 2</p>
<p>Understand that bile is produced by the liver and stored in the gall bladder.</p> <p>Understand the role of bile in neutralising stomach acid and emulsifying lipids.</p> <p>Understand how the small intestine is adapted for absorption, including the structure of a villus</p> <p style="text-align: right;">(continued)</p>	<p>1 and 2</p>

Understand the role of enzymes as biological catalysts in metabolic reactions	1 and 2
Understand how temperature changes can affect enzyme function, including changes to the shape of active site	1 and 2
Understand how enzyme function can be affected by changes in pH altering the active site	1 and 2
<b><i>Practical task:</i></b>	
<i>Investigate how enzyme activity can be affected by changes in temperature</i>	1 and 2
<b><i>Investigate how enzyme activity can be affected by changes in pH</i></b>	<b>2</b>

### 3.3 Respiration

Content detail	IGCSE Exam. Paper
<p>Understand how the process of respiration produces ATP in living organisms</p> <p>Know that ATP provides energy for cells</p> <p>Describe the differences between aerobic and anaerobic respiration</p> <p>Know the word equation and the balanced chemical symbol equation for aerobic respiration in living organisms.</p> <p>Know the word equation for anaerobic respiration in plants and in animals.</p> <p><b>Practical tasks:</b></p> <p><i>Investigate the evolution of carbon dioxide and heat from respiring seeds or other suitable living organisms</i></p>	<p>1 and 2</p>

### 3.4 Gas exchange in humans

Content detail	IGCSE Exam. Paper
Describe the structure of the thorax, including the ribs, intercostal muscles, diaphragm, trachea, bronchi, bronchioles, alveoli and pleural membranes	1 and 2
Understand the role of the intercostal muscles and the diaphragm in ventilation	1 and 2
Explain how alveoli are adapted for gas exchange by diffusion between air in the lungs and blood in capillaries.	1 and 2
<b>Understand the role of diffusion in gas exchange.</b>	<b>2</b>
Understand the biological consequences of smoking in relation to the lungs and the circulatory system, including coronary heart disease.	1 and 2
<p><b>Practical task:</b></p> <p><i>Investigate breathing in humans, including the release of carbon dioxide and the effect of exercise</i></p>	1 and 2

### 3.5 Plant nutrition

Content detail	IGCSE Exam. Paper
<p>Understand the process of photosynthesis and understand its importance in conversion of light energy to chemical energy</p> <p>Know the word equation and the balanced chemical symbol equation for photosynthesis</p> <p>Understand how varying carbon dioxide concentration, light intensity and temperature affects the rate of photosynthesis</p> <p>Describe the structure of the leaf and explain how it is adapted for photosynthesis</p> <p>Understand that plants require mineral ions for growth and that magnesium ions are needed for chlorophyll and nitrate ions are needed for amino acids</p> <p><b>Practical tasks:</b></p> <p><i>Investigate photosynthesis, showing:</i></p> <ul style="list-style-type: none"> <li>• <i>the evolution of oxygen from a water plant</i></li> <li>• <i>the production of starch</i></li> <li>• <i>the requirements of light, carbon dioxide and chlorophyll</i></li> </ul>	<p>1 and 2</p>

### 3.6 Gas exchange in plants

Content detail	IGCSE Exam. Paper
<b>Understand the role of diffusion in gas exchange.</b>	2
<b>Understand gas exchange (of carbon dioxide and oxygen) in relation to respiration and photosynthesis</b>	2
<b>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.</b>	2
<b>Understand how the structure of the leaf is adapted for gas exchange</b>	2
<b>Describe the role of stomata in gas exchange</b>	2
Understand the origin of carbon dioxide and oxygen as waste products of metabolism and their loss from the stomata of a leaf	1 and 2
<b><i>Practical tasks:</i></b>	
<b><i>Investigate the effect of light on net gas exchange from a leaf, using hydrogen-carbonate indicator</i></b>	2

### 3.7 Ecology

Content detail	IGCSE Exam. Paper
<p>Understand the terms: population, community, habitat and ecosystem</p> <p>Understand how abiotic and biotic factors affect the population size and distribution of organisms</p> <p><b>Understand the term biodiversity</b></p> <p><b><i>Practical task:</i></b></p> <p><i>Investigate the population size of an organism in two different areas using quadrats</i></p> <p><b><i>Investigate the distribution of organisms in their habitats and measure biodiversity using quadrats</i></b></p>	<p>1 and 2</p> <p>1 and 2</p> <p><b>2</b></p> <p>1 and 2</p> <p><b>2</b></p>
<p>Understand the names given to different trophic levels to include:</p> <ul style="list-style-type: none"> <li>• producers</li> <li>• primary, secondary and tertiary consumers</li> <li>• decomposers</li> </ul> <p>Understand the concepts of:</p> <ul style="list-style-type: none"> <li>• food chains,</li> <li>• food webs,</li> <li>• pyramids of number,</li> <li>• pyramids of biomass and</li> <li>• pyramids of energy transfer.</li> </ul> <p>Understand the transfer of substances and of energy along a food chain</p> <p>Understand why only about 10% of energy is transferred from one trophic level to the next</p>	<p>1 and 2</p> <p>1 and 2</p> <p>1 and 2</p> <p>1 and 2</p>