AQA GCSE Biology Topic Checklists
4.4 Bioenergetics

4.4.1 Photosynthesis				
Topic	**Success Criteria**	**Progress**		
Photosynthetic Reaction	I can write a word equation to represent photosynthesis.			
	I can name the substances represented by the chemical symbols CO_2, H_2O, O_2 and $C_6H_{12}O_6$.			
	I can explain why photosynthesis is an endothermic reaction.			
Rate of Photosynthesis	I can explain the effect of the following factors on the rate of photosynthesis: • temperature; • light intensity; • carbon dioxide concentration; • amount of chlorophyll.			
	I can describe an experiment to investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed (required practical activity 6).			
	I can measure and calculate rates of photosynthesis.			
	I can extract and interpret graphs of photosynthetic rate involving one limiting factor.			
	I can plot and draw appropriate graphs, selecting an appropriate scale for axes.			
	(HT only) I can explain graphs of photosynthesis rate involving two or three factors and decide which is the limiting factor.			
	(HT only) I can use inverse proportion – the inverse square law and light intensity in the context of photosynthesis.			
	(HT only) I can explain why limiting factors are important in the economics of enhancing the conditions in greenhouses.			
Uses of Glucose from Photosynthesis	I can describe some ways that the glucose produced in photosynthesis may be used.			
	I can explain how plants produce proteins.			

4.4.2 Respiration

Topic	Success Criteria	Progress		
Aerobic and Anaerobic Respiration	I can explain why cellular respiration is an exothermic reaction.			
	I can explain how the energy transferred by respiration in cells is used by the organism.			
	I can 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.			
	I can write a word equation to represent aerobic respiration.			
	I can name the substances represented by the chemical symbols $C_6H_{12}O_6$, O_2, CO_2 and H_2O.			
	I can write a word equation to represent anaerobic respiration in muscles.			
	I can explain the difference in the amount of energy transferred in anaerobic respiration compared to aerobic respiration.			
	I can write a word equation to represent anaerobic respiration in plant and yeast cells.			
	I can describe some commercial uses of anaerobic respiration in yeast cells (fermentation).			
Response to Exercise	I can describe how the human body reacts to the increased demand for energy during exercise.			
	I can explain what type of respiration takes place if insufficient oxygen is supplied and the effect this has on muscles.			
	(HT only) I can describe what happens to accumulated lactic acid after exercise.			
	(HT only) I can give a definition for the term 'oxygen debt'.			
Metabolism	I can explain the importance of sugars, amino acids, fatty acids and glycerol in the synthesis and breakdown of carbohydrates, proteins and lipids.			
	I can give a definition for the term 'metabolism'.			
	I can give some examples of metabolism in living organisms.			

AQA GCSE Biology Topic Checklists **4.1 Cell Biology**

4.1.1 Cell Structure				
Topic	**Success Criteria**	**Progress**		
Eukaryotes and Prokaryotes	I can name and identify the main parts present in a eukaryotic cell.			
	I can name and identify the main parts present in a prokaryotic cell.			
	I can describe how genetic material is stored in bacterial cells.			
	I can compare the relative sizes of prokaryotic cells and eukaryotic cells.			
	I can make order of magnitude calculations, including the use of standard form.			
Animal and Plant Cells	I can name and identify the main parts present in most animal cells.			
	In addition to the parts found in animal cells, I can name and identify the main parts present in most plant cells.			
	I can explain how the main sub-cellular structures are related to their functions.			
	I can describe how to use a light microscope to observe, draw and label a selection of plant and animal cells (required practical activity 1).			
Cell Specialisation	I can give some examples of specialised animal cells.			
	I can give some examples of specialised plant cells.			
	I can explain how the structure of different types of cells relate to their function in a tissue, an organ or organ system, or the whole organism.			
Cell Differentiation	I can describe when differentiation occurs in most types of animal cells and in many types of plant cells.			
	I can describe the main purpose of cell division in mature animals.			
	I can explain the importance of cell differentiation.			
Microscopy	I understand how microscopy techniques have developed over time.			
	I can explain how electron microscopy has increased understanding of sub-cellular structures.			
	I can carry out calculations involving magnification, real size and image size using the formula: $\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$			
	I can express answers in standard form where appropriate.			

Topic	Success Criteria	Progress		
Culturing Microorganisms	I can describe how bacteria multiply by simple cell division (binary fission) and the conditions in which this happens.			
	I know that bacteria can be grown in a nutrient broth solution or as colonies on an agar gel plate.			
	I know that uncontaminated cultures of microorganisms are required for investigating the action of disinfectants and antibiotics.			
	I can describe how to prepare an uncontaminated culture using aseptic technique.			
	I can explain why: • Petri dishes and culture media must be sterilised before use; • inoculating loops used to transfer microorganisms to the media must be sterilised by passing them through a flame; • 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.			
	I can calculate cross-sectional areas of colonies or clear areas around colonies using πr^2.			
	I can calculate the number of bacteria in a population after a certain time if given the mean division time.			
	(HT only) I can express answers in standard form.			
	I can describe an experiment to investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measure zones of inhibition (required practical activity 2).			

4.1.2 Cell Division				
Topic	**Success Criteria**	**Progress**		
Chromosomes	I can describe where chromosomes are located in a human body cell.			
	I can explain the difference between chromosomes, DNA and genes.			
	I can give the number of chromosomes present in a human body cell and how these are arranged.			
Mitosis and the Cell Cycle	I can describe what happens to the genetic material in cells during the cell cycle.			
	I can describe the stages of the cell cycle, including mitosis.			
	I can explain why cell division by mitosis is important in multicellular organisms.			
	I can recognise and describe situations where mitosis occurs.			
Stem Cells	I can give a definition for the term 'stem cell'.			
	I can describe the function of stem cells in embryos, in adult animals and in the meristems in plants.			
	I can describe how stem cells in embryos can be cloned and made to differentiate into most different types of human cells.			
	I can describe the process of therapeutic cloning.			
	I can explain how treatment with stem cells may be able to help conditions such as diabetes and paralysis.			
	I can describe how stem cells from adult bone marrow can form many types of cells including blood cells.			
	I can evaluate the practical risks and benefits, as well as social and ethical issues, of the use of stem cells in medical research and treatments.			
	I can describe how meristem tissue in plants can differentiate into any type of plant cell, throughout the life of the plant.			
	I can give examples of how stem cells from meristems in plants can be used.			

4.1.3 Transport in Cells

Topic	Success Criteria	Progress		
Diffusion	I can describe how substances are transported into and out of cells by diffusion.			
	I can give examples of some substances that are transported in and out of cells by diffusion.			
	I can explain how the following factors affect the rate of diffusion: • difference in concentration (concentration gradient); • temperature; • surface area of the membrane.			
	I can explain how the surface area to volume ratio of a single-celled organism allows sufficient transport of molecules into and out of the cell to meet the needs of the organism.			
	I can calculate and compare surface area to volume ratios.			
	I can explain the need for exchange surfaces and a transport system in multicellular organisms in terms of surface area to volume ratio.			
	I can describe how the small intestine and lungs in mammals, gills in fish and the roots and leaves in plants are adapted for exchanging materials.			
	I can explain why surfaces and organ systems in multicellular organisms are specialised.			
	I can explain how 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.			
Osmosis	I can describe how substances are transported into and out of cells by osmosis.			
	I can describe an experiment to investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue (required practical activity 3).			
	I can use simple compound measures of rate of water uptake.			
	I can use percentages and calculate percentage gain and loss of mass of plant tissue.			
	I can plot, draw and interpret graphs to show the gain or loss of mass of plant tissue.			

Topic	Success Criteria	Progress		
Active Transport	I can describe how substances are transported into and out of cells by active transport.			
	I can explain why active transport is used to absorb mineral ions into plant root hairs.			
	I can explain why active transport is used to absorb sugar molecules from the gut into the blood.			
	I can explain the differences between diffusion, osmosis and active transport.			

AQA GCSE Biology Topic Checklists
4.2 Organisation

4.2.1 Principles of Organisation				
Topic	**Success Criteria**	**Progress**		
Principles of Organisation	I can explain the differences between cells, tissues, organs and organ systems.			

4.2.2 Animal Tissues, Organs and Organ Systems				
Topic	**Success Criteria**	**Progress**		
The Human Digestive System	I can describe how the organs of the digestive system work together to digest and absorb food.			
	I can describe how to test for sugars, starch, proteins and lipids using qualitative reagents, including the expected results (required practical activity 4).			
	I can describe the role of enzymes in digestion.			
	I can describe how enzyme activity is affected by temperature and pH changes.			
	I can carry out rate calculations for chemical reactions.			
	I can explain enzyme action using the 'lock and key theory', including the specificity of the active site.			
	I can recall the sites of production and the action of amylase, proteases and lipases.			
	I can give the reactants and products of the reactions catalysed by carbohydrases (including amylase), proteases and lipases.			
	I can describe a method to investigate the effect of pH on the rate of reaction of amylase enzyme (required practical activity 5).			
	I can explain what the products of digestion are used for in the body.			
	I can give the sites of production and storage of bile.			
	I can describe the function of bile and explain why it is alkaline.			

Topic	Success Criteria	Progress		
The Heart and Blood Vessels	I can name and identify the main structures associated with the lungs.			
	I can explain how the lungs are adapted for gaseous exchange.			
	I can name and identify the four chambers of the heart.			
	I can explain the role of the heart in a double circulatory system.			
	I can name and identify the main blood vessels associated with the heart.			
	I can explain how resting heart rate is controlled.			
	I can describe the function of artificial pacemakers.			
	I can identify the three different types of blood vessel present in the body.			
	I can explain how the structure of arteries, veins and capillaries relates to their function.			
	I can use simple compound measures such as rate and carry out rate calculations for blood flow.			
Blood	I can name the four components of blood.			
	I can describe the functions of each of the components of blood.			
	I can recognise the different types of blood cells in a photograph or diagram.			
	I can explain how the different types of blood cells are adapted to their functions.			
	I can evaluate the risks related to the use of blood products.			
Coronary Heart Disease: A Non-Communicable Disease	I can describe what happens to the coronary arteries in coronary heart disease and explain how this affects the heart muscle.			
	I can describe how stents are used to treat coronary heart disease.			
	I can describe how statins are used to treat coronary heart disease.			
	I can describe how heart valves may become faulty and explain the consequences of faulty heart valves.			
	I can describe how faulty heart valves can be replaced using biological or mechanical valves.			
	I can describe how a donor heart, or heart and lungs can be transplanted in the case of heart failure.			

Topic	Success Criteria	Progress		
	I can explain when an artificial heart might be used.			
	I can evaluate the advantages and disadvantages of treating cardiovascular diseases by drugs (statins), mechanical devices (stents) or transplant.			
Health Issues	I can give a definition for the term 'health'.			
	I can give some factors that contribute to ill physical and mental health.			
	I can describe how different types of diseases may interact.			
	I can construct and interpret frequency tables and diagrams, bar charts and histograms, and use a scatter diagram to identify a correlation between two variables.			
The Effect of Lifestyle on Some Non-Communicable Diseases	I can discuss the human and financial cost of some non-communicable diseases to an individual, a local community, a nation or globally.			
	I can give some examples of risk factors that are linked to an increased rate of a disease.			
	I can explain the effect of lifestyle factors including diet, alcohol and smoking on the incidence of non-communicable diseases at local, national and global levels.			
	I can explain that many diseases are caused by the interaction of a number of factors.			
	I can extract and interpret information from charts, graphs and tables, and use a scatter diagram to identify a correlation between two variables in terms of risk factors.			
Cancer	I can give a definition for the term 'cancer'.			
	I can explain the difference between benign and malignant tumours.			
	I can give some lifestyle and genetic risk factors for various types of cancer.			

4.2.3 Plant Tissues, Organs and Systems				
Topic	**Success Criteria**	**Progress**		
Plant Tissues	I can name and identify the main tissues present in plants.			
	I can explain how the structures of plant tissues are related to their functions.			
	I can describe the structure of a leaf.			
Plant Organ System	I can name the parts of a plant that form an organ system for the transport of substances around the plant.			
	I can explain how the structure of root hair cells is adapted for the efficient uptake of water by osmosis, and mineral ions by active transport.			
	I can describe the role of xylem tissue in plants.			
	I can explain how the structure of xylem tissue is adapted for the transport of water in the transpiration stream.			
	I can describe the role of stomata and guard cells in leaves.			
	I can explain the effect of the following factors on the rate of transpiration: • temperature; • humidity; • air movement; • light intensity.			
	I can describe the role of phloem tissue in plants.			
	I can explain how the structure of phloem tissue is adapted for the transport of sugars by translocation.			

AQA GCSE Biology Topic Checklists
4.3 Infection and Response

4.3.1 Communicable Diseases				
Topic	**Success Criteria**	**Progress**		
Communicable (Infectious) Diseases	I can give a definition for the term 'pathogen' and give some examples of pathogens.			
	I can describe some ways that diseases caused by viruses, bacteria, protists and fungi are spread.			
	I can explain how the spread of diseases can be reduced or prevented.			
	I can describe how bacteria and viruses reproduce inside the body.			
	I can explain how bacteria can make us feel ill.			
	I can explain how viruses can cause cell damage.			
Viral Diseases	I can describe how measles is spread.			
	I can describe the symptoms of measles.			
	I can explain why most young children are vaccinated against measles.			
	I can describe how HIV is spread.			
	I can describe the initial symptoms of HIV infection.			
	I can explain when late-stage HIV infection (AIDS) occurs.			
	I can describe the signs of tobacco mosaic virus (TMV) infection in plants.			
	I can explain how TMV affects the growth of plants.			
Bacterial Diseases	I can describe how *Salmonella* food poisoning is spread.			
	I describe the symptoms of *Salmonella* food poisoning and explain how they are caused.			
	I can explain how the spread of *Salmonella* in poultry is controlled in the UK.			
	I can describe how gonorrhoea is spread.			
	I can describe the symptoms of gonorrhoea.			
	I can explain how the spread of gonorrhoea can be controlled.			
	I can explain why gonorrhoea is no longer easily treated with the antibiotic penicillin.			

Topic	Success Criteria	Progress		
Fungal Diseases	I can describe how rose black spot is spread in the environment.			
	I can describe the signs of rose black spot in plants.			
	I can explain how rose black spot affects the growth of plants.			
	I can explain how rose black spot can be treated.			
Protist Diseases	I can describe how malaria is spread.			
	I can describe the symptoms of malaria.			
	I can explain how the spread of malaria can be controlled.			
Human Defence Systems	I can describe the non-specific defence systems of the human body against pathogens.			
	I can explain the role of the immune system in the defence against disease.			
	I can explain how white blood cells help to defend against pathogens by: • phagocytosis; • antibody production; • antitoxin production.			
Vaccination	I can explain how vaccination prevents illness.			
	I can explain how the spread of pathogens can be reduced by immunising a large proportion of the population (herd immunity).			
Antibiotics and Painkillers	I can describe how antibiotics, such as penicillin help to cure bacterial disease.			
	I can explain why it is important that specific bacteria are treated using specific antibiotics.			
	I can explain why the emergence of strains resistant to antibiotics is of great concern.			
	I can explain why antibiotics cannot be used to treat viral infections.			
	I can explain what painkillers are used for.			
	I can explain why it is difficult to develop drugs that kill viruses.			

Topic	Success Criteria	Progress		
Discovery and Development of Drugs	I can recall the plant or microorganism from which the following drugs were extracted: • the heart drug digitalis; • the painkiller aspirin; • the antibiotic penicillin.			
	I can describe how new drugs are synthesised.			
	I can explain why new drugs have to be tested and trialled before being used.			
	I can describe how preclinical testing is done in a laboratory.			
	I can describe the stages of a clinical trial using healthy volunteers and patients.			
	I can explain the use of a placebo in a double-blind trial.			

4.3.2 Monoclonal Antibodies (HT Only)

Topic	Success Criteria	Progress		
Producing Monoclonal Antibodies	I can give a definition for the term 'monoclonal antibody'.			
	I can describe how monoclonal antibodies are produced.			
	I can explain why lymphocytes and tumour cells are used in the production of monoclonal antibodies.			
Uses of Monoclonal Antibodies	I can describe some ways in which monoclonal antibodies can be used.			
	I can explain how tests or treatments involving monoclonal antibodies work when given appropriate information.			
	I can explain why monoclonal antibodies are not yet as widely used as everyone hoped when they were first developed.			

4.3.3 Plant Disease				
Topic	**Success Criteria**	**Progress**		
Detection and Identification of Plant Diseases	(HT only) I can describe some signs of plant diseases.			
	(HT only) I can explain how plant diseases can be identified.			
	I can give some of the causes of plant diseases.			
	I can describe how plants are affected by tobacco mosaic virus (a viral disease).			
	I can describe how plants are affected by rose black spot (a fungal disease).			
	I can describe how plants are affected by aphids (insects).			
	I can explain how plants can be damaged by nitrate deficiency.			
	I can explain how plants can be damaged by magnesium deficiency.			
Plant Defence Responses	I can describe some physical plant defence responses to resist invasion of microorganisms.			
	I can describe some chemical plant defence responses.			
	I can describe some mechanical adaptations of plants.			