edexcel

AS and A Level Biology A (Salters-Nuffield)

EDEXCEL AS AND A LEVEL BIOLOGY A – WHAT'S CHANGED

Pearson Edexcel AS and A level Biology A

What's changed?

There have been changes in wording in the specification which do not affect the content to be taught – these have not been included below. However, some changes in wording do affect the actual content. In these cases bold text has been used to indicate these changes.

Where all of the content is new, bold text has been used through the statement. There are also instances where content has been moved from old A2 to AS – this is shown in bold italicised text.

Level	Topic	Spec. points	New content included and changed emphasis	Content not included and major changes
AS	Circulation and the heart	1.4 ii	Know how the relationship between heart structure and function can be investigated practically.	
AS	CVD	1.7	Know **how** factors such as genetics, diet, age, gender, high blood pressure, smoking and inactivity increase the risk of cardiovascular disease (CVD).	
AS	Carbohydrates	1.12	Know the difference between monosaccharides, disaccharides and polysaccharides, **including** glycogen and starch (amylose and amylopectin).	
AS	Gas exchange	2.1 ii	**Understand how the rate of diffusion is dependent on these properties and can be calculated using Fick's Law of Diffusion.**	

Level	Topic	Spec. points	New content included and changed emphasis	Content not included and major changes
		2.4	Understand what is meant by passive transport (diffusion, facilitated diffusion), active transport (including the role of ATP **as an immediate source of energy**), endocytosis and exocytosis.	
AS	Genetic code	2.7	Understand the nature of the genetic code (triplet code, ***non-overlapping and degenerate***).	
AS	Protein synthesis	2.6 i and ii	Understand the process of protein synthesis (transcription) including the role of RNA polymerase, translation, messenger RNA, transfer RNA, ribosomes and the role of start and stop codons. ***Understand the roles of the DNA template (antisense) strand in transcription, codons on messenger RNA and anticodons on transfer RNA.***	Outline the process of protein synthesis, including the role of transcription, translation, messenger RNA, transfer RNA and the template (antisense) DNA strand **(details of the mechanism of protein synthesis on ribosomes are not required at AS).**
AS	Protein structure	2.9 iv	**Know the molecular structure of a globular protein and a fibrous protein and understand how their structures relate to their functions (including haemoglobin and collagen).**	
AS	Enzyme action	Core practical	**CORE PRACTICAL 4**: Investigate the effect of enzyme **and substrate** concentrations on the initial rates of reactions.	
AS	Genetics	2.13 i	Know the meaning of the terms: gene, allele, genotype, phenotype, recessive, dominant, **incomplete dominance**, homozygote and heterozygote.	

Level	Topic	Spec. points	New content included and changed emphasis	Content not included and major changes
		2.13 ii	**Understand patterns of inheritance**, including the interpretation of genetic pedigree diagrams, **in the context of monohybrid inheritance.**	The interpretation of genetic pedigree diagrams, in the context of traits such as cystic fibrosis, albinism, thalassaemia, garden pea height and seed morphology.
A	Gene therapy			Describe the principles of gene therapy and distinguish between somatic and germ line therapy.
AS	Genetic screening	2.15 i	Understand the uses of genetic screening, including the identification of carriers, pre-implantation genetic diagnosis (PGD) and prenatal testing, **including** amniocentesis and chorionic villus sampling.	
AS	Cell structure	3.1	**Know that all living organisms are made of cells, sharing some common features.**	
AS	Cell structure	-	**Be able to recognise the organelles in 3.2 from electron microscope (EM) images.**	
		3.4	**Know the ultrastructure of prokaryotic cells, including cell wall, capsule, plasmid, flagellum, pili, ribosomes, mesosomes and circular DNA**.	
AS	Mammalian gamete structure	3.6	Understand how mammalian gametes are specialised for their functions **(including the acrosome in sperm and the zona pellucida in the egg).**	
AS	Mammalian fertilisation	3.7	Know the process of fertilisation in mammals, including the acrosome reaction, **the cortical reaction** and the fusion of nuclei.	

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AS	Chromosomes and genes	3.8 i and ii	**Know that a locus (loci) is the location of genes on a chromosome.** **Understand the linkage of genes on a chromosome and sex linkage.**	
AS	Meiosis and genetic variation	3.9	Understand the role of meiosis in **ensuring** genetic variation through the production of non-identical gametes as a consequence of independent assortment of chromosomes and crossing over **of alleles between chromatids** (details of the stages of meiosis are not required).	
AS	Gene expression	3.12	Understand how cells become specialised through differential gene expression, producing active mRNA leading to synthesis of proteins, which in TURN control cell processes or determine cell structure in animals and plants **including lac operon.**	
		3.14 ii and iii	**Know how epigenetic changes, including DNA methylation and histone modification, can modify the activation of certain genes.** **Understand how epigenetic changes can be passed on following cell division.**	
		N/A		Describe how totipotency can be demonstrated practically using plant tissue culture techniques (e.g. animal hair colour, human height, monoamine oxidase A (MAOA) and cancers), but the data on the relative contributions of genes and environment is often difficult to interpret.

Level	Topic	Spec. points	New content included and changed emphasis	Content not included and major changes
		3.15	Understand how some phenotypes are affected by **multiple alleles** for the same gene at many loci (polygenic inheritance) as well as the environment and how this can give rise to phenotypes that show continuous variation.	
AS	Variety of life	4.1	**Know that over time the variety of life has become extensive but is now being threatened by human activity.**	
AS	Biodiversity	4.2 ii and iii	Know how biodiversity can be measured within a habitat using species richness and within a species using genetic diversity **by calculating the heterozygosity index (H):** $H = \frac{\text{number of heterozygotes}}{\text{number of individuals in the population}}$ **Understand how biodiversity can be compared in different habitats using Simpson's diversity index:** $(D) = \frac{N(N-1)}{\sum n(n-1)}$	Describe how biodiversity can be measured within a habitat using species richness and within a species using genetic diversity, eg variety of alleles in a gene pool.
AS	Population Genetics	4.5 i and ii	**Understand how the Hardy-Weinberg equation can be used to see whether a change in allele frequency is occurring in a population over time.** **Understand that reproductive isolation can lead to accumulation of different genetic information in populations potentially leading to the formation of new species.**	

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AS	Classification	4.6 i and ii	**Understand that classification is a means of organising the variety of life based on relationships between organisms using differences and similarities in phenotypes and in genotypes, and is built around the concept of species.** Understand the process and importance of critical evaluation of new data by the scientific community, which leads to new taxonomic groupings, including the three domains of life based on molecular phylogeny**, which are Bacteria, Archaea, Eukaryota.**	
			4.8 Be able to recognise the organelles in 4.7 from electron microscope (EM) images.	
AS	Plant anatomy	Core practical	**Core practical 6**: Identify sclerenchyma fibres, **phloem sieve tubes** and xylem vessels and **their location within stems** through a light microscope.	Identify sclerenchyma fibres and xylem vessels as seen through a light microscope.
		4.11	Know the similarities and differences between the structures, position in the stem and function of sclerenchyma fibres (support), xylem vessels (support and transport of water and mineral ions) and **phloem (translocation of organic solutes).**	Compare the structures, position in the stem and function of sclerenchyma fibres (support) and xylem vessels (support and transport of water and mineral ions).
AS	Bacterial growth	4.14	**Understand the conditions required for bacterial growth.**	
AS	Bacterial growth and its control	Core practical	**Core practical 9**: Investigate the antimicrobial properties of plants, **including aseptic techniques for the safe handling of bacteria.**	

A level

Level	Topic	Spec. points	New content included	Content not included in the new spec.
A level	Ecology	5.1	**Understand the terms ecosystem, community, population and habitat.**	
A level	Ecology practical	Core practical	**Core practical 10**: **Carry out a study on the ecology of a habitat, such as using quadrats and transects to determine distribution and abundance of organisms, and measuring abiotic factors appropriate to the habitat.**	Describe how to carry out a study on the ecology of a habitat to produce valid and reliable data (including the use of quadrats and transects to assess abundance and distribution of organisms and the measurement of abiotic factors, e.g. solar energy input, climate, topography, oxygen availability and edaphic factors).
A level	Photosynthesis practical	Core practical	**Core practical 11**: **Investigate photosynthesis using isolated chloroplasts (the Hill reaction).**	
A level	Climate change	5.12 to 5.15, 5.20	**Climate change.**	Global warming.
A level	Speciation	5.19	Understand how isolation **reduces gene flow between populations leading to allopatric or sympatric speciation.**	Explain how reproductive isolation can lead to speciation.
A level	Enzyme practical	Core practical	**Core practical 12: Investigate the effect of temperature on the initial rate of an enzyme-catalysed reaction, to include Q10.**	

Level	Topic	Spec. points	New content included	Content not included in the new spec.
A level	Carbon Cycle	5.21 and 5.22	Understand how knowledge of the carbon cycle can be applied to methods to reduce atmospheric levels of carbon dioxide. **Understand how reforestation and the use of sustainable resources including biofuels are examples of the effective management of the conflict between human needs and conservation.**	Discuss how understanding the carbon cycle can lead to methods to reduce atmospheric levels of carbon dioxide (including the use of biofuels and reforestation).
A level	N/A	All now at AS 2.6 and 2.7		Explain the process of protein synthesis (transcription, translation messenger RNA, transfer RNA, ribosomes and the role of start and stop codons) and explain the roles of the template (antisense) DNA strand in transcription, codons on messenger RNA, anticodons on transfer RNA. Explain the nature of the genetic code (triplet code, non-overlapping and degenerate).
		6.14	**Understand the growth of bacteria in ideal conditions** and the difference between bacteriostatic and bactericidal antibiotics	
A level	Respiration	7.3 ii	**Understand that respiration is a many-stepped process with each step controlled and catalysed by a specific intracellular enzyme.**	
		Now at AS 5.6		Recall how phosphorylation of ADP requires energy and how hydrolysis of ATP provides an accessible supply of energy for biological processes.

Level	Topic	Spec. points	New content included	Content not included in the new spec.
A level	Respiration (cont.)	7.4	Understand the roles of glycolysis in aerobic and anaerobic respiration, including the phosphorylation of hexoses, the production of ATP, reduced coenzyme, **pyruvate and lactate** (details of intermediate stages and compounds are not required).	
		7.5	Understand **the role of the link reaction** and the Krebs cycle in the complete oxidation of glucose and formation of carbon dioxide (CO_2), ATP, reduced NAD and reduced FAD (names of other compounds are not required) **and why these steps take place in the mitochondria, unlike glycolysis which occurs in the cytoplasm.**	
A level	Cardiac cycle	7.8 ii	Understand how the normal electrical activity of the heart coordinates the heart beat, including the roles of the sinoatrial node (SAN), the atrioventricular node (AVN), the bundle of His **and the Purkyne fibres.**	
		7.9 i 7.9 ii	**Be able to calculate cardiac output.** Understand how variations in ventilation and cardiac output enable rapid delivery of oxygen to tissues and the removal of carbon dioxide from them, including how the heart rate and ventilation rate are controlled and the roles of the cardiovascular control centre and the ventilation centre **in the medulla oblongata**.	

Level	Topic	Spec. points	New content included	Content not included in the new spec.
A level	Spirometer practical	Core practical	**CORE PRACTICAL 17**: Investigate the effects of exercise on tidal volume, breathing rate, **respiratory minute ventilation and oxygen consumption** using data from spirometer traces.	
		7.11	**Understand what is meant by negative and positive feedback.**	
		7.13	Understand the analysis and interpretation data relating to possible disadvantages of exercising too much (wear and tear on joints, suppression of the immune system) and exercising too little (increased risk of obesity, **cardiovascular disease (CVD)** and diabetes), recognising correlation and causal relationships.	
A level	Nervous system	8.3	Understand how a nerve impulse (action potential) is conducted along an axon including changes in membrane permeability to sodium and potassium ions and the **myelination in saltatory conduction.**	Describe how a nerve impulse (action potential) is conducted along an axon including changes in membrane permeability to sodium and potassium ions and the role of the nodes of Ranvier.
A level	Plant sensitivity	8.6	**Understand how phytochrome and IAA bring about responses in plants to environmental cues, including their effects on transcription.**	Describe how plants detect light using photoreceptors and how they respond to environmental cues.
A level	Animal sensitivity	8.7	**Understand how co-ordination is brought about through** nervous and hormonal **control** in animals.	Compare mechanisms of coordination in plants and animals, i.e. nervous and hormonal, including the role of IAA in phototropism (details of individual mammalian hormones are not required).

Level	Topic	Spec. points	New content included	Content not included in the new spec.
A level	Brain	8.8	Know the location and functions of the cerebral hemispheres, hypothalamus, cerebellum and medulla oblongata **in the human brain.**	Locate and state the functions of the regions of the human brain's cerebral hemispheres (ability to see, think, learn and feel emotions), hypothalamus (thermoregulate), cerebellum (coordinates movement) and medulla oblongata (controls the heartbeat).
A level	Brain imaging	8.9	Understand how magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), **positron emission tomography (PET)** and computed tomography (CT) scans are used in medical diagnosis and the investigation of brain structure and function.	
A level	Visual development	8.10	**Understand what happens during the critical period so that mammals can develop their visual capacities to the full.**	Discuss whether there exists a critical 'window' within which humans must be exposed to particular stimuli if they are to develop their visual capacities to the full.
A level		8.13	**Understand how animals, including humans, can learn by habituation.**	
A level	Drug treatment of the brain	8.14	Understand how imbalances in certain, naturally occurring brain chemicals can contribute to ill health, **including** dopamine in Parkinson's disease and serotonin in depression, and to the development of new drugs.	Explain how imbalances in certain, naturally occurring, brain chemicals can contribute to ill health (eg dopamine in Parkinson's disease and serotonin in depression) and to the development of new drugs.
A level	Application and ethics of gene sequencing	8.16	Understand how the outcomes of **genome sequencing projects** are being used in the development of **personalised medicine** and the social, moral and ethical issues this raises.	Discuss how the outcomes of the Human Genome Project are being used in the development of new drugs and the social, moral and ethical issues this raises.

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ALWAYS LEARNING

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