UNIT 1 - BIOCHEMISTRY

ADV. BIOLOGY I

Content

- Macromolecules
- Carbohydrates
- Monosaccharides
- Disaccharides
- Polysaccharides
- Reducing and non reducing sugar tests
- Iodine solution test
- Proteins
- Levels of structure
- Globular proteins
- Fibrous proteins
- Biuret test
- Nucleic acids in brief
- Lipids
- Triglycerides
- Phospholipids
- Emulsion test
- Water properties and functions
- Mineral ions

Resources & ICT

- Keynote presentation and associated key point sheets and quizzes
- Past paper practice questions
- Molecule kits
- Text book, chapter 2

Types of assessment

- Key points homework sheets
- Quizzes
- Question and answer in class,
- Chapter summary notes
- Individual practicals and write ups
- Topic test

Students to Know

- Ionic, covalent, hydrogen bonds and hydrophobic interactions
- The difference between monomers and polymers
- Structural and chemical formulae of monosaccharides, disaccharides, polysaccharides, amino acids, polypeptides, proteins, fatty acids, glycerol, triglycerides and phospholipids
- The properties of water
- The uses on inorganic ions in animals and plants

Students to Understand

- The link between the structure and function of biological molecules
- The importance of hydrogen bonds and their function in water
- The difference between and importance of hydrolysis and condensation
- The significance of saturated and unsaturated fatty acids and lipids

Students to be able to Do

- Identify diagrams and formulae of biological molecules
- Describe the structure and function of biological molecules
- Outline the roles of inorganic ions in living organisms
- Test experimentally for reducing and non-reducing sugars, starch, lipids and proteins

Cross curricular links

- Advanced Chemistry 2; biological molecules

Differentiation incl. EAL

- Put students into groups based on relative strengths and weaknesses
- Set work to cover basics depending on prior knowledge
- Extension work
- By outcome - summary notes

Learning styles activities

- Question and answer
- Practical and model work (in groups and independently)
- Summary of chapter notes including diagrams
- Application of knowledge to unfamiliar questions

Ant feeding on sugar

Global citizenship, internationalism, local environment

- Lake Geneva as an example of habitats, including freezing over and links to properties of water
- Discussion about ice caps, habitats and global warming

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September - 3 weeks

UNIT 2 - CELLS, CELL MEMBRANES AND TRANSPORT, MICROSCOPY

ADV. BIOLOGY I

Content

- Cell organelles
- Structure and function
- Origin of eukaryotes
- Animal cells
- Plant cells
- Prokaryotes versus eukaryotes
- Cells, tissues and microscopy
- Optical versus electron microscopes
- Scanning versus transmission electron microscopes
- Scale and plan drawings
- Cell membrane structure
- Functions of the components of cell membranes
- Transport across membranes
- Simple diffusion
- Facilitated diffusion
- Osmosis
- Active transport

Resources & ICT

- Digital microscope, slides
- Past paper practice questions
- Text book, chapter 1, 4

Types of assessment

- Quizzes
- Question and answer in class,
- Chapter summary notes
- Individual practicals and write ups
- Topic test

Students to Know

- The differences between eukaryotic and prokaryotic cells
- Cell organelle structure and function
- Cell membrane structure and function
- Diffusion (simple and facilitated), osmosis and active transport
- Endo and exocytosis

Students to Understand

- How the cell organelles work together to make proteins, lipids, synthesise DNA, transport substances
- How the parts of a cell membrane are related to their functions
- How simple and facilitated diffusion differ
- How water potential is made up of solute potential and pressure potential
- How active transport differs from the other forms of transport

Students to be able to Do

- Draw plan diagrams
- Calculate scale using a microscope
- Identify tissues on plant slides
- Conduct experiments on intercellular transport

Cross curricular links

- Mathematics; construction of graphs and calculations based on them
- Physics; electromagnetic spectrum, wavelengths

Differentiation incl. EAL

- Put students into groups based on relative strengths and weaknesses
- Set work to cover basics depending on prior knowledge
- Extension work
- By outcome - summary notes

Learning styles activities

- Question and answer
- Practical and model work (in groups and independently)
- Summary of chapter notes including diagrams
- Application of knowledge to unfamiliar questions

Chloroplasts visible in the cells of Plagiomnium affine

Global citizenship, internationalism, local environment

- Examples of organisms that carry out endo and exocytosis that live in Lake Geneva and our surroundings

UNIT 3 - CELL DIVISION, DNA AND PROTEINS, ENZYMES

ADV. BIOLOGY I

Content

- Mitosis
- Phases
- Importance
- DNA
- Structure
- Semi-conservative replication
- Protein synthesis - transcription
- Translation
- mRNA, rRNA, tRNA
- Enzymes
- Temperature
- Substrate/enzyme concentration
- pH
- Inhibitors
- Competitive
- Non-competitive

Resources & ICT

- YouTube playlists
- Worksheets
- Past paper practice questions
- Molecule kits
- DNA models
- Text book, chapters 3, 5, 6

Types of assessment

- Quizzes
- Question and answer in class,
- Chapter summary notes
- Individual practicals and write ups
- Topic test

Students to Know

- The phases of mitosis
- The structure of DNA
- How this structure relates to DNA replication and protein synthesis
- Enzyme theory factors that affect reaction rates

Students to Understand

- How mitosis creates genetically identical daughter cells
- How the structure of DNA is suited to creating exact copies of itself semi conservatively
- How the DNA code relates to protein primary structure
- How a functioning protein is made
- How enzymes behave under different conditions
- The differences between competitive and non competitive inhibitors

Students to be able to Do

- Describe the events of the phases of mitosis
- Use triplet code tables to work out the primary structure of a protein
- Calculate the number of different proteins made from DNA codes
- Conduct practicals on enzymes based on temperature and pH change
- Interpret data from practicals based on inhibitors

Cross curricular links

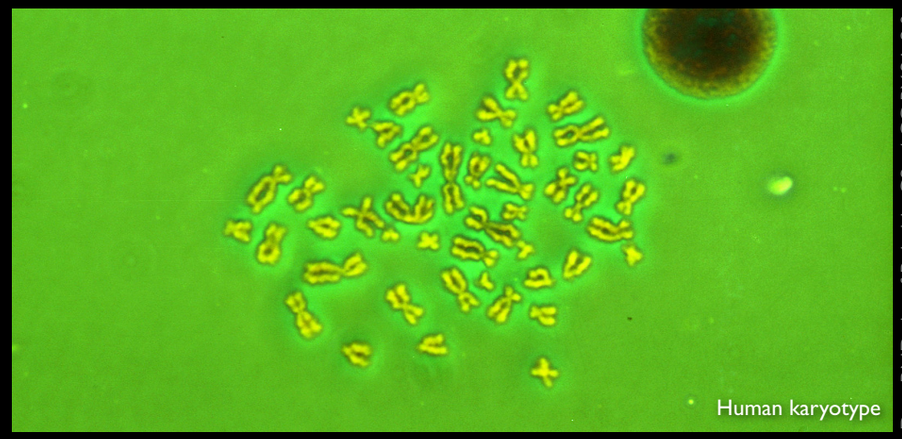
- Advanced Chemistry 2; protein synthesis and enzymes

Differentiation incl. EAL

- Put students into groups based on relative strengths and weaknesses
- Set work to cover basics depending on prior knowledge
- Extension work
- By outcome - summary notes

Learning styles activities

- Question and answer
- Practical and model work (in groups and independently)
- Summary of chapter notes including diagrams
- Application of knowledge to unfamiliar questions



Human karyotype

Global citizenship, internationalism, local environment

- The discovery of the DNA double helix
- The implications of this on international science and our every day lives, with respect to gene technology, the Human Genome Project and studying human evolution

UNIT 4 - BULK TRANSPORT IN ANIMALS AND PLANTS

ADV. BIOLOGY I

Content

- Circulatory system
- Plasma/tissue fluid/lymph
- White blood cells in brief
- Platelets
- Red blood cells
- Oxygen dissociation curves
- Carbon dioxide and carbon monoxide transport
- Artery and vein structure
- Capillaries and substance exchange
- Heart structure
- Control of heart beat
- Pressure changes in the heart
- Respiratory system
- Lung structure
- Breathing, gas exchange
- Lung and heart disease
- Fitness and exercise
- Plants - xylem, phloem
- Root, stem and leaf cross sections
- Apoplast, symplast and vacuolar pathways

Resources & ICT

- Worksheets
- Microscopes and digital microscope
- Models
- Past paper practice questions
- Text book, chapters 8, 9,10

Types of assessment

- Key points homework sheets
- Quizzes
- Question and answer in class,
- Chapter summary notes
- Individual practicals and write ups
- Topic test

Students to Know

- Parts, functions and diseases of the circulatory and respiratory systems
- Functions of the blood and lymph
- Gas exchange and oxygen dissociation
- Vascular tissues in plants and transpiration

Students to Understand

- How oxygen loads and unloads from haemoglobin
- How water and assimilates move through plants

Students to be able to Do

- Interpret oxygen dissociation curves
- Conduct experiments on transpiration

Cross curricular links

- PSHE; health of the heart and lungs with respect to smoking related diseases
- Chemistry; the importance of hydrogen bonding in water

Differentiation incl. EAL

- Put students into groups based on relative strengths and weaknesses
- Set work to cover basics depending on prior knowledge
- Extension work
- By outcome - summary notes

Learning styles activities

- Question and answer
- Practical and model work (in groups and independently)
- Summary of chapter notes including diagrams
- Application of knowledge to unfamiliar questions

Camel Thorn Tree (Acacia erioloba), Namibia

Global citizenship, internationalism, local environment

- Discussion and experiments on plants adapted to different habitats - desert, mountain, beach, temperate
- The affects of smoking related diseases on individuals and larger groups
- The work of the WHO and other organisations on collecting data on disease

UNIT 5 - IMMUNITY AND DISEASE

ADV. BIOLOGY I

Content

- Infectious diseases
- Cholera
- Malaria
- HIV
- TB
- Disease statistics and the WHO
- Epidemiological and experimental evidence
- Immune system
- Phagocytosis
- Macrophages
- Neutrophils
- Lymphocytes
- B lymphocytes
- T lymphocytes
- Memory cells
- Vaccination
- Eradication of disease
- Small pox versus measles
- Asthma

Resources & ICT

- Web based research on infectious diseases and related data
- YouTube playlists
- Past paper practice questions
- Text book, chapter 11, 15, 16

Types of assessment

- Key points homework sheets
- Quizzes
- Question and answer in class,
- Chapter summary notes
- Individual practicals and write ups
- Topic test

Students to Know

- The pathogen, methods of transmission, prevention and treatments of malaria, cholera, HIV and TB
- The cells of the immune system - lymphocytes and phagocytes
- How vaccinations and antibiotics work
- The history of the attempted eradications of small pox and measles

Students to Understand

- What factors make some diseases more difficult to fight than others
- How the many cells of the immune system work together

Students to be able to Do

- Interpret health statistics and comment on the incidence of diseases

Cross curricular links

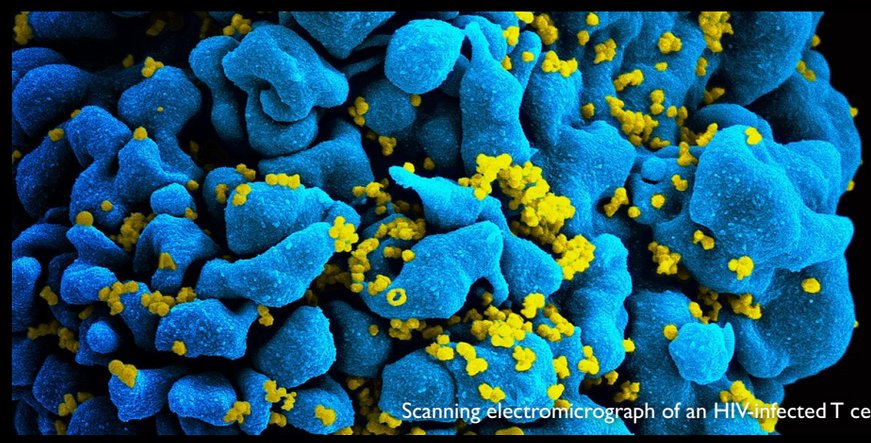
- PSHE; health
- Geography; the impact of disease on LEDC's versus MEDC's

Differentiation incl. EAL

- Put students into groups based on relative strengths and weaknesses
- Set work to cover basics depending on prior knowledge
- Extension work
- By outcome - summary notes

Learning styles activities

- Question and answer
- Practical and model work (in groups and independently)
- Summary of chapter notes including diagrams
- Application of knowledge to unfamiliar questions



Scanning electromicrograph of an HIV-infected T cell

Global citizenship, internationalism, local environment

- WHO statistics and incidence of disease by country, continent etc.
- The affect of poverty, war and natural disasters on the ability of individuals to fight disease and on organisations who are attempting to treat disease

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February - 3 weeks

UNIT 6 - ECOLOGY

ADV. BIOLOGY I

Content

- Energy transfer
- Food chains
- Food webs
- Energy losses
- Accumulation of poisons
- Water and carbon cycles
- Nitrogen cycle
- Nitrogen fixing
- Nitrification
- Denitrification
- Ammonification
- Importance in agriculture
- Leguminous plants
- Root nodules

Resources & ICT

- Past paper practice questions
- YouTube playlists
- Text book, chapter 7

Types of assessment

- Key points homework sheets
- Quizzes
- Question and answer in class,
- Chapter summary notes
- Individual practicals and write ups
- Topic test

Students to Know

- How energy moves from the sun, through organisms and how it is eventually lost
- The main points of the carbon and water cycles
- The methods of using gaseous nitrogen in organisms

Students to Understand

- Why energy is lost at each tropic level
- Why poisons accumulate at each tropic level
- How energy can be lost but carbon, water and nitrogen are in fixed, finite amounts on Earth
- Why it is necessary to use bacteria to convert gaseous nitrogen into usable nitrates and ammonium so that plants and animals can make protein

Students to be able to Do

- Calculate energy losses
- Construct energy, number and biomass pyramids

Cross curricular links

- Geography; nutrient cycles
- History/geography; crop rotation

Differentiation incl. EAL

- Put students into groups based on relative strengths and weaknesses
- Set work to cover basics depending on prior knowledge
- Extension work
- By outcome - summary notes

Learning styles activities

- Question and answer
- Practical and model work (in groups and independently)
- Summary of chapter notes including diagrams
- Application of knowledge to unfamiliar questions

The Heart of Voh, New Caledonia

Bananaflo / GPL

Global citizenship, internationalism, local environment

- Recycling of water on a small and global scale
- The dangers of over use of nitrogen fertilisers. Examples, lake Geneva
- Low nitrogen environments. Examples, bogs - Ireland. North Carolina - the Venus Fly Trap

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March - 2 weeks