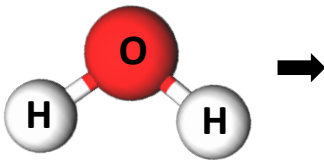


1.1 – WATER

- A1.1.1 Water as the medium for life
- A1.1.2 Hydrogen bonds as a consequence of the polar covalent bonds within water molecules
- A1.1.3 Cohesion of water molecules due to hydrogen bonding and consequences for organisms
- A1.1.4 Adhesion of water to materials that are polar or charged and impacts for organisms
- A1.1.5 Solvent properties of water linked to its role as a medium for metabolism and for transport in plants and animals
- A1.1.6 Physical properties of water and the consequences for animals in aquatic habitats
- D2.3.1 Solvation with water as the solvent

WATER STRUCTURE

Draw additional water molecules to show how they interact (include polarity and types of bonding)



PROPERTIES OF WATER

Complete the following table:

Property	Description	Biological Significance
Thermal		
Cohesive		
Adhesive		
Solvent		

SOLUBILITY

Distinguish between hydrophobic and hydrophilic (including specific biological examples)

Compare the solubility and mode of transport of different biomolecules within the bloodstream

Substance	Solubility	Mode of transport
Salt (NaCl)	High	
Glucose		Freely transported within the bloodstream (as monomers)
Oxygen	Low	
Triglycerides + cholesterol	Insoluble	
Amino acids		Transported in an ionised state (zwitterion)

BIOLOGICAL ADAPTATIONS

Complete the following table:

Property	Definition	Loon Consequences	Seal Consequences
Buoyancy			
Viscosity			
Thermal Conductivity			
Specific Heat Capacity			

Note: All of the physical properties are greater within water than in the air

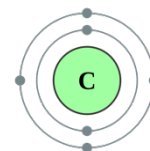
1.2 – ORGANIC COMPOUNDS

- B1.1.1** Chemical properties of a carbon atom allowing for the formation of diverse compounds upon which life is based
- B1.1.2** Production of biomolecules by condensation reactions that link monomers to form polymers
- B1.1.3** Digestion of polymers into monomers by hydrolysis reactions

CARBON COMPOUNDS

Distinguish between organic compounds and inorganic compounds

Identify the property of carbon that enables it to form diverse compounds (chains or rings)



POLYMERISATION

Distinguish between condensation and hydrolysis reactions

Condensation:

Hydrolysis:

Fill in the gaps:

- monosaccharide + monosaccharide $\xrightleftharpoons[\text{hydrolysis}]{\text{condensation}}$ + water
- + $\xrightleftharpoons[\text{hydrolysis}]{\text{condensation}}$ triglyceride + water (×3)
- amino acid + amino acid $\xrightleftharpoons[\text{hydrolysis}]{\text{condensation}}$ + water

TYPES OF ORGANIC COMPOUNDS

Compare and contrast the four different types of organic compounds commonly found in cells

Biomolecule	Monomer / Subunit	Polymer	Example
Carbohydrate			
Lipid			
Protein			
Nucleic Acid			

Note: Lipids do not contain monomers, but triglycerides and phospholipids have distinct subunits

Draw molecular diagrams for the different types of organic monomers / subunits

Glucose (α -D)	Ribose
Amino Acid	Nucleotide
Fatty Acid (saturated)	

1.3 – NUCLEIC ACIDS

- A1.2.1** DNA as the genetic material of all living organisms
- A1.2.2** Components of a nucleotide
- A1.2.3** Sugar-phosphate bonding and the sugar-phosphate “backbone” of DNA and RNA
- A1.2.4** Bases in each nucleic acid that forms the basis of a code
- A1.2.5** RNA as a polymer formed by condensation of nucleotide monomers
- A1.2.6** DNA as a double helix made of two antiparallel strands of nucleotides with two strands linked by hydrogen bonds between complementary base pairs
- A1.2.7** Differences between DNA and RNA
- A1.2.8** Role of base pairing in allowing genetic information to be replicated and expressed
- A1.2.9** Diversity of possible DNA base sequences and the limitless capacity of DNA for storing data
- A1.2.10** Conservation of the genetic code across life forms as evidence of universal common ancestry

DNA VERSUS RNA

Differentiate between the structures of DNA and RNA

	DNA	RNA
Type of pentose sugar		
Base composition		
Number of strands		

State the role of the three different types of RNA

mRNA: _____

tRNA: _____

rRNA: _____

GENETIC MATERIAL

Outline the role of DNA as the genetic material in living organisms

1. _____

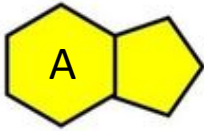
2. _____

NUCLEOTIDE STRUCTURE

Draw a simple diagram (with labelling) of the structure of a single nucleotide

BASE PAIRING

Identify and distinguish between the different nitrogenous bases



DNA STRUCTURE

Outline how nucleotides are linked together to form double-stranded DNA molecules

Include: Complementary base pairing, antiparallel strands, double helix structure



1.4 – CARBOHYDRATES

- B1.1.2** Production of biomolecules by condensation reactions that link monomers to form polymers
- B1.1.4** Form and function of monosaccharides
- B1.1.5** Polysaccharides as energy storage compounds
- B1.1.6** Structure of cellulose related to its function as a structural polysaccharide in plants
- B1.1.7** Role of glycoproteins in cell-cell recognition

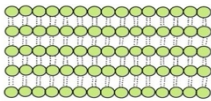

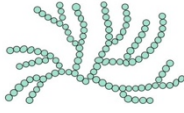
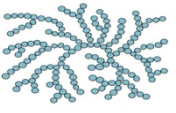
MONOSACCHARIDES

Describe how polysaccharides are produced from monosaccharides



POLYSACCHARIDES

Contrast the structure and the function of the different polymers of glucose

	Cellulose	Starch		Glycogen
		Amylose	Amylopectin	
Shape	 <i>linear chains</i>	 <i>coiled / helical</i>	 <i>branched</i>	 <i>highly branched</i>
Monomer				
Bonding				
Function				

ENERGY STORAGE

Compare the use of carbohydrates and lipids as an energy source in humans

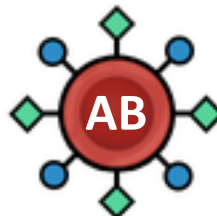
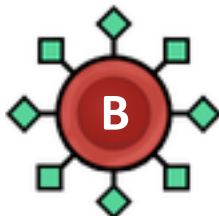
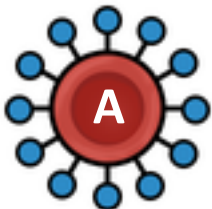
Include: Type of storage, osmotic effect on cells, ease of digestion / transport, energy content

Carbohydrates:

Triglycerides:

GLYCOPROTEINS

Outline the role of glycoproteins in cell-cell communication (including the use of ABO antigens)

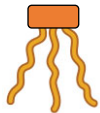
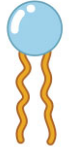



1.5 – LIPIDS

- B1.1.8** Hydrophobic properties of lipids
- B1.1.9** Formation of triglycerides and phospholipids by condensation reactions
- B1.1.10** Difference between saturated, monounsaturated and polyunsaturated fatty acids
- B1.1.11** Triglycerides in adipose tissues for energy storage and thermal insulation
- B1.1.12** Formation of phospholipid bilayers as a consequence of hydrophobic and hydrophilic regions
- B1.1.13** Ability of non-polar steroids to pass through the phospholipid bilayer

TYPES OF LIPIDS

Outline the structure and function of the three main types of lipids

	Structure	Function	Image
Triglyceride			
Phospholipid			
Steroid			

FATTY ACIDS

Differentiate between saturated and unsaturated (mono- vs poly-) fatty acids

Distinguish between cis and trans isomers of unsaturated fatty acids

FATS VERSUS OILS

Compare the use of fats and oils in energy storage

	Fats	Oils
Sources		
Fatty Acids		
Shape		
State		
Melting Point		

HYDROPHOBICITY

Outline how the hydrophobic properties of lipids contribute to their functionality

Triglycerides

Phospholipids

Steroids

1.6 – PROTEINS

- B1.2.1** Generalised structure of an amino acid
- B1.2.2** Condensation reactions forming dipeptides and longer chains of amino acids
- B1.2.3** Dietary requirements for amino acids
- B1.2.4** Infinite variety of possible peptide chains
- B1.2.5** Effect of pH and temperature on protein structure

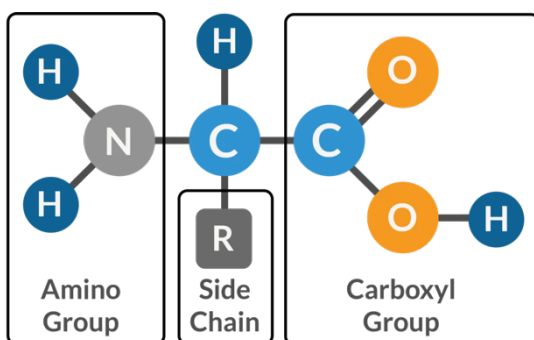
PROTEOME

Define proteome

Outline the role of genes in the determination of the proteome

AMINO ACIDS

Draw a diagram to show the formation of a peptide bond (via condensation polymerisation)



DIETARY REQUIREMENTS

Distinguish between essential and non-essential amino acids

PROTEIN FUNCTIONS

Identify the different functions of proteins, including a specific example for each

- S _____
- H _____
- I _____
- T _____
- S _____
- M _____
- E _____

DENATURATION

Define denaturation

Identify two factors that cause protein denaturation and explain how this occurs

1. _____

2. _____

