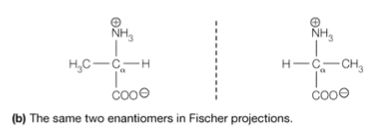
* Absorption of light – identifying and quantifying
* Modification of side chains
* Biological function of amino acids – some do things by themselves, some need to be modified
* Genes – how mRNA is made and transcribed by proteins for proteins
* Except glycine, has asymmetric carbon – C alpha is conncected to 4 H group – backbone has organic group, NH3, H, COO-
* Chirality is when side is not H, no double H
* Silica crystals grow in desserts, grow into spirals
* DNA also has left and right spirals
* L-Alanine – smallest amino acid – CH3 as side chain
* Fischer projections



* L represents laevo – left hand
* D represents dextro – right hand
* One direction is +, one is –
* Twisting to left (polarisation) is L-molecule
* R stands for rectus (right)
* S stands for sinister (left)
* Humans have all L-amino acids
* L-Glyceraldehyde – smallest sugar
* Almost all sugars we encounter are Ds
* Configurations need to be remembered
* Names need to be remembered
* 50% of L and 50% of D when making in flasks
* Ibuprofen – only D-isomer has greater activity
* Biochemical reactions result in 100% of one stereo isomer – biotechnology saves energy and makes a lot more isomers
* Amino acids are colourless but they do absorb light in the near UV – in the particular range of frequency related to its energy/wavelength
* Nanometre – 10^-9 metres – proteins absorb in UV because of aromatic side chain but absorbance is fairly weak – peaks around 280 nm – a point where we expect accurate measurement
* DNA absorbs at 260 nm – strong absorbing
* We are using spectrophotometer – generate light and have specific filter to give light at specific wavelength – sample has to be in glass that has walls that are transparent – cuvette
* Molecules are absorbing light – we see them absorbing energy – there is a lost of energy that comes out
* Instrument measures light going out and light absorbed from the other side – give us the ratio
* Identification and …… are still done via spectrophotometer
* Concentration is measured in molar/mol/L
* Log of the ratio of the amount of light that goes in and light coming out – relevant to the distance that the light travels – make the distance l as small as possible
* C is the concentration
* Absorbance A = epsilon\*l\*c
* But l = 1
* Beer-Lambert’s Law – only works with dilute concentration – work with small concentration well
* This law can identify amino acids vs proteins vs nucleotides
* Side chains frequently get modified after the proteins are made – chemically modified by …………………..
* They can take very large molecules such as sugars
* Removal of phosphate deactivates proteins
* Hydroxyproline – important for nails
* Modifications are important for signalling pathways, stabilizing structures, gene expression/suppression…
* Sometimes are phosphorylated, sometimes are not
* N- and C- termini of amino acids are chemically active – form NH3 or COO- group – they can be modified or blocked (rendered inactive) – no chemical reaction can occur
* No chlorine in biochemistry
* Popular modification of cysteine residue – 2 armstrongs long bonds – longest bonds – 3D – stable structure – can occur across different chains
* Amino acids are biologically active
* Glycine and glutamate are neurotrasmitters
* …………………………
* Histamine is the compound that causes reaction – come from proline amino acid
* Dopamine comes from tyrosine
* Thyroxine comes from different groups – is the thyroid hormones
* Most important function of amino acids – their ability to link together
* Peptide bond – multiple amino acids joining together
* Everytime peptide bond occurs – lose water – called condensation
* The ends still have charges but the intermediate charges disappear – except side chains
* Reactions of proteins don’t occur spontaneously
* Protein synthesis occurs at the ribosome – need energy by hydrolysing ATP
* Only part at C-terminus can react – similar to 3’ end of DNA
* Residues – amino acids that are parts of proteins
* Side chains carry their chemical properties into the peptides/proteins
* Protein backbone forms on a plane – cannot weaver like a ribbons
* Peptides and proteins have lots of charges – side chains continue to have charges
* N and C terminus and 5 charged residues
* Each side chain can be titrated – has different pH – overall have pI
* pI changes every time depending on the order of amino acids
* DNA is transcribed to RNA
* mRNA is transcribed by ribosome
* proteins are folded up to 3D structures
* the 3D structures define the functions of proteins
* Up to 20 amino acids – called peptide – also called oligopeptide
* Many but don’t know how many – polypeptide
* Proteins normally have more than 40 aa
* Can be more than 1 protein chains – can form multimeric proteins – no bonds between the chains – noncovalent bond interaction
* Haemoglobins – heterotetramer – 2 alpha and 2 beta chains
* Proteins are polypeptides with defined sequences
* The numbers and orders of amino acids are restricted – can be mild variation – eg. human and whale myoglobin
* 92% are identical – quite similar in mammals but quite different in others
* Insulin – earliest protein to be sequenced – small enough to be fit on the slide – A chain and B chain are held together by disulphide bonds – independent disulphide bond to help the proteins fold
* Largest known protein is titin in muscle fibres
* Most are 100-1000 aa
* Many proteins have multiple subunits – sometimes bonded together like insulin but not always
* Genes to proteins
* Solving genetic code is very important
* U is RNA and replaces T
* AUG is the start codon – code for methionine – residue Met
* Some codes for multiple amino acids
* 4 DNA bases – purine and pyrimidines are major contributors to nucleic bases
* Pyrimidines – longer name but smaller structure
* Purines and pyrimidines are always attached to pentose sugars
* Nucleic acid has phosphorous on their backbones
* Adenosine is a hormone and neuromodulator – autacoid – sleep regulator
* When adenosine rises – we get up – caffeine works similarly
* Ribose is lower version of sugar – ribose has 5 Cs – sugar has 6
* Sequence is TGCA
* A pairs with T, C pairs G
* DNA transcribed to RNA, translated to proteins
* Each codon is made up of 3 bases……………………………………….
* Translation is done only in one direction
* Negative strand is used as the template
* Junk DNA – now noncoding regions – have important information
* Met tells ribosomes where to start translating
* Insulin – when they try to find protein strains, they found preproinsulin – very long chains
* Summary
  + Stereochemistry and light absorption are what we focus on
  + Amino acid derivatives help us perform different functions – hormones, activation, glycine and glutamate are actually neurotransmitters