Urea is a compound produced by living organisms but can also be synthesized

Nitrogen containing compound with simple structure

First discovered in urine, it is a component of it

Produced when there is an excess of amino acids, and so the nitrogen is removed from them

Comes from a cycle of reactions, catalyzed by enzymes, in the liver; then it is transported to kidney for filteration and is passed out in urine

Artificially synthesized for nitrogen fertilizer**:**

- Ammonia + CO2 → Ammonium Carbamate → Urea + Water

Carbon atoms can form four bonds allowing a diversity of compounds to exist

Covalent bond- when two adjacent atoms share a pair of electrons, with one electron contributed by each atom; strongest type of bond between atoms

Carbon bonds can be with other carbons to form chains or rings; fatty acids have chains up to 20 carbon atoms; bonds can also be with other elements such as hydrogen, nitrogen, oxygen, and phosphorous

Can bound to one element or a group of elements (ethanol); can have single or double bonds

Life is based on carbon compounds such as lipids, carbohydrates, proteins, and nucleic acids

Carbohydrates- composed by carbon, hydrogen, and oxygen; with hydrogen and oxygen in the 2:1 ratio

Lipids- broad class of molecules that are insoluble in water such as steroids, waxes, fatty acids, and triglycerides;

- Triglycerides are fats if they are solid at room temperature or oils if they are liquid at room temperature

Proteins- Composed of one or more chains of amino acids; all of the amino acids in the chain include oxygen, hydrogen, carbon, and nitrogen, but two of the 20 amino acids also have sulfur

Nucleic Acids- chains of subunits called nucleotides, which have carbon, hydrogen, oxygen, nitrogen, and phosphorus; two types: RNA and DNA

Body Mass Index

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The BMI requires: mass of person in kg and their height in meters

BMI= mass in kg/ (height in meters)^2

Can also be found using chart called nomogram

The BMI is used to assess whether a person's body mass is healthy or too low or high

In some parts, world food supplies are insufficient or are unevenly distributed → underweight

Anorexia nervosa → underweight

Obesity; excessive food intake and lack of exercise causes accumulation of fat in adipose tissue, can lead to coronary heart disease and type 2 diabetes → low life expectancy and raises overall costs of health care

Evaluation- assessment of implications and limitations; evidence for health claims comes from scientific research

- Implications: Do the results of research support claim strongly, moderately, or not at all?
- Limitations- Were the methods used rigorous, or was there weakness that can be reflected in the conclusions

Answer to first question through analysis of research; analysis is easiest if results are graphical or other visual form

- Correlation between intake of lipid being investigated and rate of disease or health benefit? Could be positive or negative correlations
- How large is the difference between average rates of disease with different levels of lipid intake? Small differences may be insignificant
- How widely spread is the data? The more wide spread, the less likely is it that mean differences are significant
- Do statistical tests show significant differences?

Second question is answered by assessing methods used

- How large was the sample size? Surveys should have thousands of people to get reliable results
- How even was the sex, age, state of health and life style? The more even , the less other factors can affect
- If sample was uneven, were the results adjusted to eliminate effects of other factors?
- Were measurements of lipid intake and disease rates reliable?

Amino acids are linked together by condensation to form polypeptides

Polypeptides-

- chains of amino acids made by linking through condensation reactions
- happens in ribosomes in a process called translation
- are main component of proteins and in many proteins they are the only component;
    - some have one polypeptide and others have two or more

Amino acids can be linked together in any sequence giving a huge range of possible polypeptides

Ribosomes link amino acids until it forms the chain; ribosomes can make bonds between any two amino acids

A polypeptide of n amino acids has 20^n possible sequences

The amino acid sequence of polypeptides is coded for by genes

The number of possible sequences is immense, but organisms only produce small fraction of them

Amino acid sequence of each polypeptide is stored in a coded form in the base sequence of a gene

Some genes have other roles; most genes store amino acid sequence using genetic code; three bases of the gene are needed to code for each amino acid in the polypeptide,

so a 400 amino acid polypeptide should need 1200 bases; in reality, there are bases needed at end, beginning, and some points in the middle

open reading frame- base sequence that actually codes for a polypeptide

A protein may consist of a single polypeptide or more than one polypeptide linked together

Integrin- membrane protein with 2 polypeptides, each of which has a hydrophobic section embedded in the membrane ;The two polypeptides act as blade and handle of folding knife

Collagen- three long polypeptides wound together to form rope like molecule; great tensile strength than if they were separate; winding allows for some stretching and not snapping

Semi-Conservative Replication of DNA 6/11/2016 7:37:00 PM

Success in discovering structure of DNA was based on using evidence to develop possible structures and testing it

First model was a triple helix, with bases on the outside and magnesium holding strands together with ionic bonds to phosphates on each strand

The helical structure and spacing fit the patter obtained by Rosalind Franklin; but he rejected it since there wouldn't be enough magnesium to form cross links between strands. Also, it didn't account for the finding that #of cytosine= #of guanine and etc.

The bases were cut out from cardboard and stuck together to show base pairing; each was equal in length; then they used antiparallel strands and finally built they're second model with correct angles and lengths

Replication of DNA is semi-conservative and depends on complementary base pairing

When cell prepares to divide, two strands separate; they are then guides for the creation of a new strand

New strands made by adding nucleotides, one by one, and linking them; thus, there are two new strands made up of the old and new strand; so, it is semi conservative

Base sequence of template determines base sequence of new strand

Complementary bases form hydrogen bonds to stabilize; wrong base pairing wouldn't lead to hydrogen bonding and the new nucleotide would

- tRNA carry the amino acids and also have anti codons; bind to the mRNA
- ribosomes catalyze assembly of polypeptide and are binding sites for mRNA and tRNA

How translation works:

- mRNA binds to small subunit of ribosome
- tRNA with anticodon to first codon binds to ribosome too
- second tRNA with anticodon to second codon binds to ribosome also; only two tRNAs can be binded at the same time
- the amino acids on the tRNAs are binded together by ribosome thru peptide bonds
- First tRNA is released, the second tRNA becomes the first
- Another tRNA binds
- Another peptide bond is formed
- Process continues until stop codon is reached

Diabetes, in some individuals, is the destruction of pancreatic cells that produce insulin

Treated by introducing insulin from outside into the blood

Porcine and bovine, from pigs and cattle have both been widely used

Porcine has one difference, bovine has 3, and shark insulin (in Japan) has seventeen differences; yet, they all bind and lower blood glucose concentration

Some people become allergic to animal insulin, so human insulin is preferred

1982, human insulin was commercially available; produced using modified E. coli; since then method has developed to include yeast cells and safflower plants

Each of these species has received the gene for making human insulin; insulin produced is exactly the same as human production

All three species use the same genetic code as humans

Cell respiration is the controlled release of energy from organic compounds to produce ATP

All living cells perform; organic compounds broken down to release energy to be used by cell

Energy is released in muscle fibers by breaking glucose into CO_2 and water; the energy can be used for muscle contraction