Scientific practice

solutions

electrolytic solutions

Ionic dissociation occurs when the addition of a solvent or energy in the form of heat causes molecules if crystals of a substance to break down into ions.

Osmotic effects.

spontaneous net movement of solvent molecules through a semipermeable membrane

tonicity

hypotonic

lower ions concentration, high solvent concentration lower osmotic pressure

hypertonic

higher ion concentration, higher solute concentration, lower solvent concentration, higher osmotic pressure

isotonic

equal osmotic pressure. and solute/solvent concentrations.

Ideal Solutions

an ideal solution is a solution which has a enthalpy of solution equal to zero NOTE: bonds forming releases heat energy. FR: the concentration of water in a typical cell is 55molar.

concentration measurements

molar/molarity/molar concentration

concentration of solute in a solution in terms of moles of solute per volume of solution

molality

concentration of solute in a solution in terms of moles of solute per mass of solvent.

Other measures.

%w/w weight of solute per weight of (solvent?)

%w/v weight per volume.

%v/v volume per volume.

osmolarity

concentration of solute as total number of solute particles per litre (?)

osmolality

Concentration of solute as total number of solute particles per kilogram.

####osmol number of solute particles which contribute towards the osmolarity of the substance.

##Life Molecules

Basic list

- Carbohydrates (2%)
- Lipids (2.5%)
- Proteins (15%)
- Nucleic Acids (RNA 20% E. Coli < 10% mammalian DNA is functional)
- Inorganic ions (3% Salts, 1% small metabolites)
- water (70%)

Water

general properties

covalent bonds. dipole moment.

hydrogen bonds.

many hydrogen bonds are formed which together gain considerable strength.

Hydrogen bonds are typically up to $ angstroms in length, which a strength of 2-10kcal/mol.

NOTE: the advantage of hydrogen bonds is that they do not take too much energy to break down so the body can readily re-purpose/recycle organic compounds.

polarity

high polarity means water has a large ability to stabilise other charges

auto ionisation. water can auto ionise into hydroxide ions and hydronium ions, the concetrations of which in solution can be measured by pOH and pH respectively.

Solvation of ionic and polar solutes

$Coulomb's\ law : F = k\frac{q_1 q_2}{Dr^2}$

Where D is a measure of solvent polarity.The higher the polarity, the greater the ability to stabilise charges. water forms solvations shells around each ion.

Solvation of apolar groups and molecules (the hydrophobic effect)

free amphipathic molecules will associate in water to form hydrophobic internal environments. molecules (amphipathic molecules contain both polar and a polar groups)

Examples

Integral proteins within the cell membrane are amphipathic, and allow for non polar channels through the membrane.

fatty acids form micelles (globules) and bilayers in water.

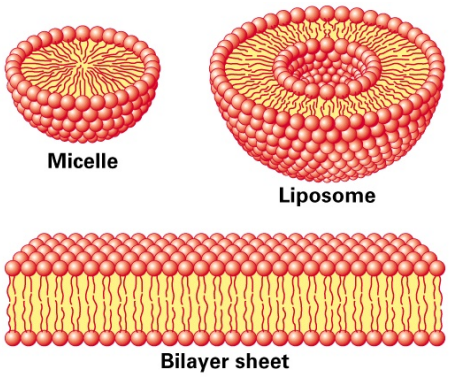

Figure 1: hydrophobicEffect

Septicaemia

Certain bacteria, respond to antibiotics by releasing proteins which punch holes in the cell surface membrane creating freely permeable pore through which cell contense can leak out, and killing the cells.

water and protein structure

water proteins can be buried in the interior of protein structures where they may furfill vital functions

examples

proteases only work if the have a water molecule imbedded within their internal structure, without this one molecule the entire enzyme becomes inactive.

other examples are reverse transcriptase and HIV protease and GST (detoxifying enzyme) which all rely on water molecules to function.

Acids and Bases

Bronsted and lowery

acids are proton donors bases are proton acceptors. difference between acid/base and its conjugate is a proton.

lewis

acids are electron pair acceptors bases are electron pair donors.

lewis bases

- alchohol
- organophosphates.

buffering

relies on weak acids or bases which do nto fully dissociate.

Scientific Reasoning

Basic structures of an argument

Premises

A Premise is a statment. This statement may be true or false.

In science the orginial premise is known as the hypothesis. this hypothesis will be tested, usually impirically.

Conclusions

A conclusion should be well supported by all premises. The conclusion leads one to decide if the hypothesis is true fo false.

A good argument

A good argument can be deductively, or nondecuctive but abductively, or inductively strong.

NOTE: Arguments can be invalid even if all of the premises and the conclusion are true. If they do not actually imply eachother then it is simply a collection of facts and not an argument.

Deductive arguments

$A \in B \land B \in C \rightarrow C \in B$

Conditional

$\exists P \rightarrow \exists Q$

Contrapositive

$\nexists P \rightarrow \nexists Q$

Converse

$\exists\ Q \rightarrow\ \exists P$

Definitions

Premise

A Premise is a statment. This statement may be true or false.

Conclusion