9/29/2020 Biochemistry Basics cont

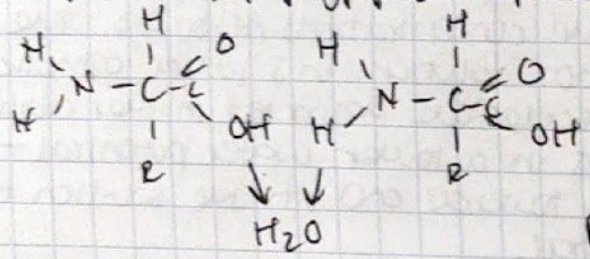
⑧ produce sucrose from glucose & fructose monomers →

$C_6H_{12}O_6 + C_6H_{12}O_6 \rightarrow C_{12}H_{22}O_{11} + H_2O$

glucose + fructose → sucrose + water

* note that while glucose and fructose have the same ~~chemical~~ molecular formula, their actual structure differs

⑨ hydrolysis of ~~pep~~ polypeptide (protein) consisting of 10 amino acids

Ex: 

1-2-3-4-5-6-7-8-9-10

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

H_2O H_2O ... 9 H_2O in total

Produces 9 H_2O during synthesis

~~NH_2CHR~~ $NH_2HCRCOOH$ → dipeptide + water

This, hydrolysis will consume 9 water molecules.

10/4/2020 EQ 2.3 Notes - Membrane Transport

EQ 2.3 ⇒ ~~brief~~ How do organisms move ions and other molecules across membranes?

passive transport ⇒ requires NO energy (spontaneous)
molecules move down concentration gradient (high → low)
decreases free energy (entropy increases)

Ex: diffusion, osmosis

diffusion ⇒ molecules spread out due to thermal energy
each substance moves down its own concentration gradient
(unaffected by concentrations of other molecules in system)

osmosis ⇒ diffusion of water across semi-permeable membrane
moves water from low solute → high solute (ie. high water → low water)

→ solution is isotonic to cell if equal concentration inside cell and out of it (net movement of water is 0)
→ solution is hypertonic to cell (cell is hypotonic to solution) if more solute is outside cell (in solution) than inside → water moves outside cell and into solution
→ solution is hypotonic to cell (cell is hypertonic to solution) if less solute is outside of cell (in solution) than inside → water moves inside cell and out of solution

10/4/2020 Bio 2.3 Notes - Membrane Transport

hypertonic ⇒ water moves inside of hypertonic thing and out of hypotonic

hypotonic ⇒ water moves out of hypotonic thing and into hypertonic

osmoregulation ⇒ cells maintain water balance in different solutions
actively pump water, etc.

facilitated diffusion ⇒ passive diffusion across certain (passively gated) channels

active transport ⇒ requires ATP to pump molecules against their concentration gradient
proteins + channels involved, maintains homeostasis

sodium-potassium pump ⇒ uses 1 ATP to pump 3 Na^+ out and 2 K^+ in
establishes more Na^+ outside of cell and K^+ inside
establishes electrochemical gradient (inside is neg)

cell → 3 Na^+
cell ← 2 K^+
− +

proton pumps ⇒ use ATP to pump H^+ ions outside of cell
concentration of protons useful for cellular work

cotransport ⇒ use ATP to actively move particle outside of cell, have it also
work as it passively diffuses back inside
(eg H^+ ions diffuse back in cell w/ sucrose)

EQ 2.3 summary ⇒ Organisms have 2 different types of mechanisms that
they use to move particles across cell membranes:
passive transport (doesn't take any energy, each
substance diffuses ~~along~~ down its own concentration
gradient) and active transport (uses ATP to move
particles against their concentration gradients). Osmosis
is a special kind of diffusion of water across a semi-
-permeable membrane (moves from low solute →
high solute). Active transport can be used to perform
osmoregulation which maintains water balance in cells
through the active pumping of water. Pumps like the
sodium-potassium and proton pumps establish electro-
-chemical gradients (more negative inside cell) that
can be harnessed to perform cellular work (eg
through cotransport).