NOTES YOU SHOULD HAVE TAKEN IN CLASS

Corrected version

Gas pressure/concentration: 1 Atm = 760 mm Hg = 10 m H_20 = 15 psi

O_2 and man: upper limit/ lower limit

Without adaptation, man can not survive on top of Mt Everest = 8,000M = 0.3Atm = height of jet liners= 0.06 Atm O_2

Man starts being affected at 0.5 ATM air = 18,000'

Maximum O_2 concentration that humans can tolerate = 2 Atm. Breathing pure oxygen 10m under water -> you will pass out in about 30 min....

Equator to north pole = 10,000 km (The basis of the meter)

Distance to moon is like 10 times around the earth.

Distance to nearest planet is 100x more than to moon

Distance to geostationary satellites = 1 times around the earth.

Distance to photo/weather/satellites and space lab is about 1/100 of this

.....

Coulomb's law $F = (kq_1q_2)/(Dr^2)$

For NaCl: $F = (k[+q_1]\ [-q_2)]\ /(Dr^2)$ = negative, thus an attraction

In H_2O: $F_H = (k[+q_1]\ [-q_2)]\ /(D_H\ r^2)$

In methanol: $F_M = (k[+q_1]\ [-q_2)]\ /(D_M\ r^2)$

Comparaison: $F_M\ /F_H = D_H\ /\ D_M = 78\ /\ 32\ \approx\ 2.5$

Conclusion: These ions **attract** each other 2.5 X better in methanol

Thus water will dissolve 2.5 x better.

Thus they separate 2.5 X better in water...

Ionization is an advantage for cellular metabolism.

.....

Length of a C-C bond = 0.15 nm <<<THIS IS YOUR GOLDEN RULER!

Other bonds in biological molecules about the same

Except C-H which is shorter!

.....

What is the osmotic pressure of a 1 M solution?

π = cRT = 1 x .08 x 300 = 24 Atm all rounded off for quick math!

QUESTION: And what will you tell the person at the bus stop who then says that he wants to use a 1 M protein solution as a pump to pump water to apartments at the top of a building?

State why will it not work theoretically: .....

Give two reasons why will it not work- practically:

1) the membrane..... 2) the solution.....

Calculate (Estimate!) how you would make up 1 L of a 1 M protein solution: .....

Then apply common sense!!

ANSWER: it not work theoretically: As you remove solution at the top, you are removing the particles that cause the osmotic pressure!
Getting energy for free and perpetual motion machines do not exist!

it not work- practically:
1) the membrane will break! It's a membrane and can not take such pressures.
2) the solution: Pick a small protein: 100 aa (amino acids)
Pick a simple molecular weight for each aa: 100 g/mol
Then molecular weight of protein would be : 100 x 100 = 10,000 g/mol
1 L of a 1 M protein solution = 10,000 g /L = **10 Kg /L**!!
Then apply common sense!! -> THIS IS IMPOSSIBLE...

.....
Normal osmotic pressure in your body 300 mOsM = 150 mM KCl
.....
Estimating logs:

number	log	estim log	
1	0.00		
2	0.30	0.30	<<know this one!
3	0.48	0.40	<Add 0.1 to get all the others
4	0.60	0.50	
5	0.70	0.60	
6	0.78	0.70	
7	0.85	0.80	
8	0.90	0.90	
9	0.95	0.95	
10	1.00	1.00	

filling in table in notes

	Estimated		Calculated		error/estim
"Acid"	K	pK	K	pK	%
H3PO4	5.4 10-2	1.4	5.4E-2	1.27	9
Citric acid	8.E-04	3.13	7.41E-04	3.13	7
Acetic	1.74 10-5	4.7	1.74E-5	4.76	-1
H2CO3	5.E-07	6.35	4.47E-07	6.35	11
H2PO4-	1.5 10-7	6.7	1.5E-7	6.82	-2
HEPES	4.E-08	7.47	3.39E-08	7.47	15
TRIS	8.3 10-9	8.1	8.3E-9	8.08	0
Boric acid	7.E-10	9.24	5.75E-10	9.24	18
NH4+	7.E-10	9.25	5.62E-10	9.25	20
HPO42-	5.E-13	12.4	3.98E-13	12.4	20

.....

Reading for first test: Chap1. Read to get key facts (size of cells) /concepts (basic genetics), not to get lists of words to memorize (like compositions, trees, elements used by life...). Don't waste time with complicated genetics math. For the moment ignore molecule and membrane sizes.
Note: Book says eukaryotic cells are 10-100 um! A human egg is 100 um but other eukaryotic cells are 10- 20 um.
.....
COLOR FOR MODEL: red=bond to oxidized end, green=bond to tail, blue= bond to OH or functional group, just bond= H