1.   Calculate the total osmolarity and the osmolarity due to impermeable solutes of a solution whose composition is 120 mM NaCl, 20 mM glucose (0.5 pts.).

Total osmolarity = _____ ___ mOsm   260

Osmolarity due to impermeable solutes = _____ _____ mOsm   260

2.   If a normal red blood cell is placed into a large volume of the solution in questions 1, the cell would (0.25 pts):

A.   maintain its normal volume.
B.   shrink, and stabilize at a new volume smaller than its initial volume.
C.   *swell, and stabilize at a new volume larger than its initial volume.
D.   swell continuously until it bursts.
E.   There is not enough information to correctly predict what will happen.

3.   The fish oil in those capsules I took with my breakfast this morning will most likely get into my cells (0.25 pts):

A.   through aquaporin channels.
B.   through K^+ channels.
C.   by a Na^+-dependent counter-transport mechanism.
D.   by a primary active transport pump that directly utilizes ATP.
E.   *by diffusing through the phospholipid bilayer of the cell membrane.

4.   Use the Nernst equation to calculate the Ca^{2+} equilibrium potential for a cell under these conditions: intracellular $[Ca^{2+}]$ = 400 nM; extracellular $[Ca^{2+}]$ = 0.4 mM; temperature = 37 °C. (Hint: these are not normal concentrations so you should not expect the usual value of E_{Ca}. More hints: 1 nM = 1 nanoMolar = 1 x 10^{-9} Molar, and 1 mM = 1 milliMolar = 1 x 10^{-3} Molar.) [0.5 pts]

A. E_{Ca} = +125 mV
B.   *E_{Ca} = +91.5 mV
C. E_{Ca} = +60.3V
D. E_{Ca} = 0 mV
E. E_{Ca} = -30.7 mV

5.   Calculate the resting membrane potential of a nerve that is only permeable to Na^+ and K^+ when gK is 3 times gNa. Assume that E_K = -90 mV and E_{Na} = +60 mV. The membrane potential, E_m, is (0.5 pts):

A.   *-52.5 mV
B.   -67.5
C.   -70.4 mV
D.   -75 mV
E.   -90 mV