Exam 1 Answers

1. d
2. False. Water’s boiling point is higher because it has more H-bonds.
3. a
4. b
5. a, b, d
6. Osmosis is the movement of solvent from a region of higher to lower solvent concentration.
7. a. -2
   b. ion pair (or salt bridge); Arg, Lys, or His
   c. 1.83-3.83, 4.69-6.69
   d. pH = pKa + log([A⁻]/[HA])
      [A⁻]/[HA] = 10^\text{pH-pKa}
      pKa₂: [COO⁻]/[COOH] = 10^{8.5-5.69} = 10^{2.81} = 646; 1/647 protonated at 1\text{st} group
      pKa₁: [COO⁻]/[COOH] = 10^{5.67} = 10^{5.67} = 467,735; 1/467,736 protonated at 2\text{nd} group
      multiply to get fraction protonated at both groups: (1/647)*(1/467,736)
      = 1/3.02×10^8 = 3.3 × 10^-9
   e. This happens halfway between the two pKa’s: (2.83 + 5.69) / 2 = 4.26
   f. In glycine, the positive charge on the amino group favors having a balancing negative charge on the carboxyl group, which promotes its deprotonation (and a lower pKa). Malonic acid lacks this charge stabilization, so it is less likely to lose a proton (so its pKa is higher).
   g. True
   h. True
   i. True
   j. False
   k. True
8. a. identity: E – 16 of 25 residues are identical
       similarity: G – 21 of 25 residues are similar;
       ‘non-similar’ residues are at positions 4 (V/P), 9 (K/P), 10 (E/Q), and 25 (E/S)
   b. A, C

9. a. 
   b. 
   c. There is steric hindrance caused by the alignment of the backbone amide N-H’s.
10. α-helix: 1.5Å/aa; β-strand (antiparallel): 3.5Å/aa
    30Å helix ÷ 1.5Å/aa = 20 aa’s
    20 aa’s x 3.5Å/aa = 70Å
11. a. False
    b. False
    c. True
    d. β
    e. L-mannose (or β-L-mannopyranose)
12. (1) Lipids are more reduced than carbohydrates
    (2) Carbohydrates are hydrated
13. Stearic acid

14. a. 
   b. 22:6 (Δ^{4,7,10,13,16,19})