1) How does structural alignment violate the dynamic programming principle?
[10 pts]

2) Draw the Voronoi volume for the central atom (black circle) in the figure below:
[5 pts]
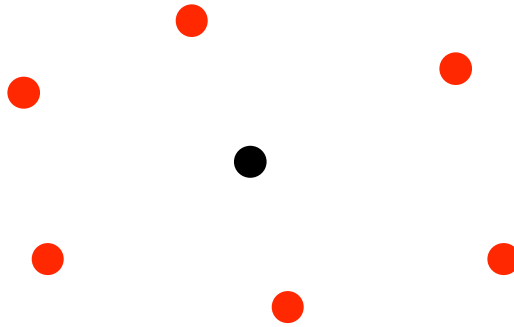
3) Label the molecular surfaces in the figure below (red boxes): [9 pts]
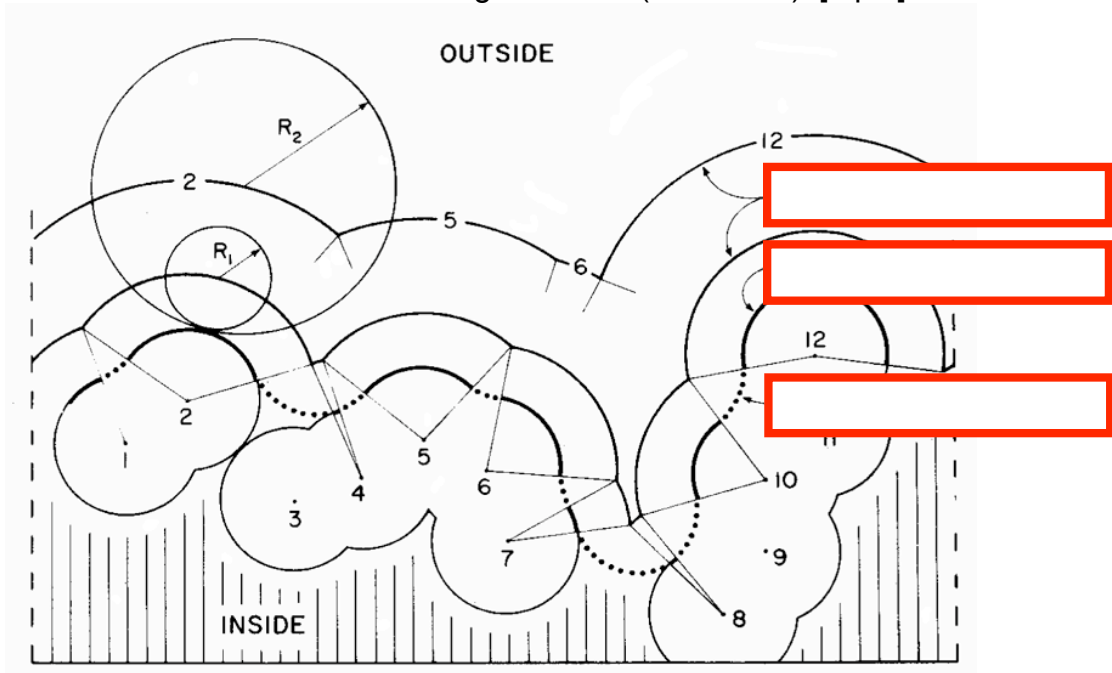
4) The Voronoi volume of an atom is a weighted average of distances to all its neighbors, where the weighting factor is the _____. [5 pts]

A) distance from the closest neighbor's centroid
B) contact area with the neighbor
C) torsion angle between atoms
D) magnitude of the Van der Waals force
E) none of the above

5) Briefly explain simulated annealing. [10 pts]

6) In network analysis, what probability distribution is used to calculate enrichment? [5 pts]

7) Dijkstra's algorithm is used to: [5 pts]

A) find the path traveling through the fewest nodes
B) calculate the clustering coefficient
C) find the shortest path in a graph between two nodes
D) find the path that visits each node exactly once
E) none of the above

8) Semantic web: What does OWL stand for? [5 pts]

9) Phylogenomics: Name three factors that cause incongruent gene histories. [9 pts]

10) Briefly explain the differences between Woese's Domains of life and the Five Kingdom system. Why is the Five Kingdom system deficient? [12 pts]

11) What is principal component analysis (PCA)? When is it applied? [10 pts]

12) When does PCA produce the same result as Single-Value Decomposition (SVD)? [5 pts]

A)   PCA never produces the same results as SVD
B)   PCA always produces the same results as SVD
C)   When the data points are translated with respect to the original origin
D)   When the data points are centered with respect to the original origin
E)   None of the above

13) Why does metagenomics reveal information about microbial communities that can't be determined using a traditional genomics approach? [10 pts]