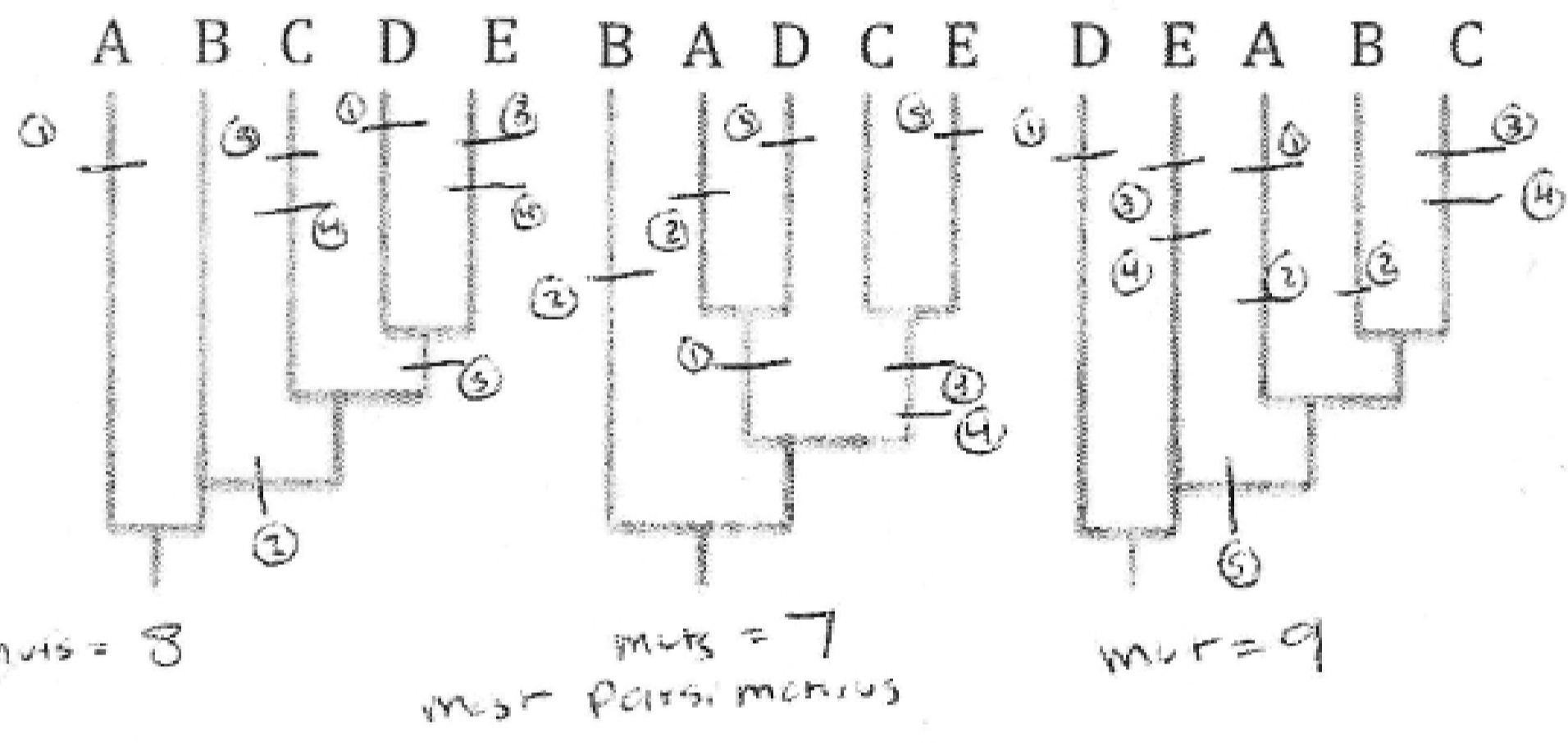
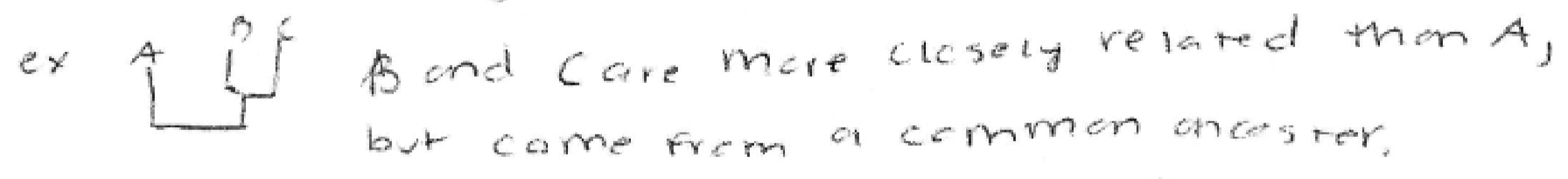


1. What is the definition of a phylogenetic tree? (5 pts.) Given the following data, select the most parsimonious tree from the following options. SHOW YOUR WORK to receive credit. 15 points.

	character 1	character 2	character 3	character 4	character 5
taxa A	A	A	A	T	A
taxa B	T	A	A	T	A
taxa C	T	T	T	A	A
taxa D	A	T	A	T	T
taxa E	T	T	T	A	T



Phylogenetic trees are diagrams used to show relatedness and genetic origin of species. Organisms ~~related~~ in the same taxonomic group will be on adjacent lines.



2. List and describe four repair systems for mutations (4 points each). Now give an example of a mutation and describe how one of these repair systems could work to fix it. (4 pts)

① Photoreactivation

- * use PR enzyme that binds to Thymine ~~Dimer~~ Dimer.
- * A photon of light causes the dimer to break apart.
- * Allows proper DNA replication once the TT is broken apart.

② UVRABC

- * Repairs Thymine Dimers by excising dimer and few nucleotides surrounding it using endonuclease.
- * Uses complementary strand to fill in the gap.

③ Recombinational Repair

- * Double stranded break repair.
- * Both strands are broken, so must use sister chromatid as template to fill in gap.
- * Uses process of recombination.
- * Still end up with strand that has mutations.

④ SOS Repair

- * Repairs gaps during DNA replication with random nucleotides.
- * repair is still mutational, but not as harmful as gaps in DNA.

Mutation: UV damage causing Thymine Dimer formation. Photoreactivation enzyme binds to TT and once subjected to a photon of light, the TT breaks apart.

Johannes

3. Define the following terms precisely. Give an example to supplement your definition(s). 25 points.

a. Genetic drift

b. Molecular clock

c. Evolution

d. Mutation

e. Parsimony

a) genetic drift: change in alleles/ mutations due to CHANCE alone. like a piano falling from the sky randomly kills all the sooty moths, so only white moths remain. in other words, white moths didn't survive ~~from~~ over sooty moths for some beneficial adaptation, just because chance killed the sooty moths.

b) molecular clock: mutations occur randomly & @ a low CONSTANT rate. thus we can use the # of mutations accrued to estimate back in time to when 2 species separated. for example, it's being used to estimated when AIDS jumped to people (by comparing # mutations in current vs. older strains).

c) evolution: is the change in allele frequency (over time). for example, Darwin's finches' beak alleles changed over time & now they fill different dietary niches.

d) mutation: change in base pairs ^{of DNA} due to spontaneous reasons, or from some external force → induced. drives genetic diversity & evolution. a UV light, has high energy & can induce thymine dimers to form in DNA → type of mutation.

e) parsimony: the idea that the simplest explanation is best. in phylogenetic trees w/ lots of taxa, the tree with the fewest evolutionary changes, is usually the best/correct one.