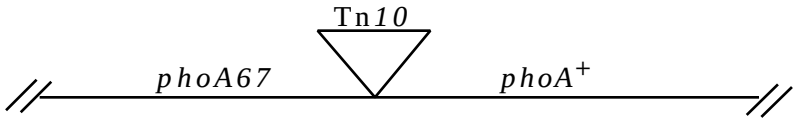
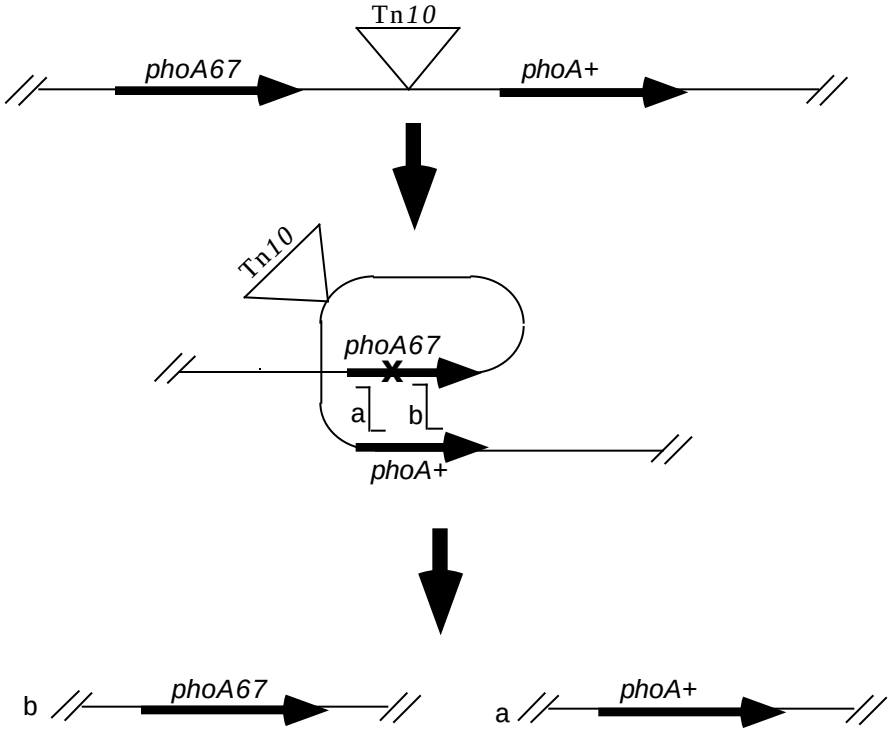
One-minute write 4/215/00

phoA67 is a missense mutation in the *E. coli* alkaline phosphatase gene that has a dominant-negative phenotype. Strains that have a tandem duplication with one copy of the *phoA67* gene and one copy of the *phoA*$^+$ gene are phenotypically PhoA$^-$.



a. Suggest a possible mechanism for the dominant-negative phenotype of the *phoA67* mutation.
ANSWER: Because PhoA must function as a dimer, it is likely that the dominant-negative phenotype is due to the formation of nonfunctional dimers.

b. In the absence of tetracycline, the *phoA67* / *phoA*$^+$ duplication segregrates in 10% of the cells. Two classes of segregrants were obtained. Draw a picture showing how the segregration occurs and indicate the phenotypes of the two types of segregrants.



Note:

(1) two classes of segregrants are obtained depending upon where the cross-over occurs (cross-over "a" yields *phoA*$^+$ and cross-over "b" yields *phoA* mutants);
(2) all segregrants lose the Tn*10* at the join point of the duplication, thus both classes of segregrants are Tet sensitive;
(3 recombination occurs between direct repeats of the homologous sequences.