ONE-MINUTE WRITE 1/20/00

Question: Four independent mutations were obtained that affect the synthesis or assembly of fimbriae. The properties of the mutations are described in the table below (where + indicates that fimbriae were produced and – indicates that no fimbriae were produced).

Mutation	Growth temperature			
	30°C	42°C	$30 \rightarrow 42^{\circ}C$	$42 \rightarrow 30^{\circ}C$
fim ⁺	+	+	+	+
<i>fim</i> (null allele)	-	_	_	_
fim-1	-	+		
fim-2	+	_		
fim-3	_	+		
fim-4	+	_		
fim-1 fim-2	-	_	+	-
fim-1 fim-3	-	-	-	-
fim-1 fim-4	_	_	_	+

- (a) Based upon the above results, indicate whether each of the single mutations is a temperature sensitive (Ts) or cold sensitive (Cs) mutation.
- (b) Based upon the above results, what is the predicted order of the mutant gene products in the pathway of fimbriae synthesis and assembly?

Answers:

- (a) *fim-1* and *fim-3* are Cs mutations; *fim-2* and *fim-4* are Ts mutations.
- (b) It is not possible to infer the order of fim-1 vs fim-3 because the double mutant is defective under all growth conditions.

The results suggest that fim-2 acts before fim-1 because the product if only made if the cells are first grown at 30°C where fim-2 is active, then shifted to 42°C where fim-1 is active – hence fim-1 must convert an intermediate made by fim-2 into the product.

The results suggest that *fim-1* acts before *fim-4* because the product if only made if the cells are first grown at 42° C where *fim-1* is active, then shifted to 30° C where *fim-4* is active – hence *fim-4* must convert an intermediate made by *fim-1* into the product.

Thus, the gene products probably act in the pathway in the following order: fim-2 fim-1 fim-4