18.E: Transcriptional regulation after initiation (Exercises)

18.1 Which of the following statements concerning the action of N protein are true?

1. N action requires sequences on the DNA called nutL+ and nutR+.
2. N activity requires a host function encoded by nusA+.
3. N protein acts to promote rho-dependent termination.
4. N protein can relieve the polarity of certain amber mutations.

18.2 Antitermination at tL1 by N protein allows read-through transcription through int, which encodes the integrase enzyme. However, large amounts of the Int protein are not produced lytic infection, because these transcripts continue past the r-dependent terminator tnt. This allows the formation of a secondary structure in the RNA that serves as a signal for RNases to degrade the transcripts from the 3’ end. Why are large amounts of Int made during lysogeny?

18.3 Sketch the RNA secondary structures in the trp leader/attenuator region being translated by a ribosome under conditions of low and high concentrations of tryptophan.

What determines the progress of the ribosome, and how does this affect trp expression?

18.4 Which of the following events occur when E. coli is starved for the amino acid tryptophan?

1. No tryptophanyl-tRNA is made.
2. The ribosome translates the leader peptide completely (to the UGA stop codon).
3. A G+C rich stem-loop structure forms in the nascent RNA (regions 3 and 4) at the attenuator site.
4. A step-loop structure forms in the nascent RNA (regions 2 and 3) that precludes formation of the G+C rich stem-loop at the attenuator site.
5. Transcription reads through the attenuator into trp EDCBA.
18.5 (POB) Transcription attenuation.

In the leader region of the trp mRNA, what would be the effect of:

1. Increasing the distance (number of bases) between the leader peptide gene and sequence 2?
2. Increasing the distance between sequences 2 and 3?
3. Removing sequence 4?