TUTORIAL 3: DNA Transcription

Q1. Define transcription in the context of molecular biology. (2 marks)

Q2. What are the two chemical differences between DNA and RNA? (2 marks)

Q3. Name the enzyme responsible for synthesizing mRNA during transcription. (1 mark)

Q4. Explain the role of the sigma factor in bacterial transcription. (3 marks)

Q5. Why are consensus sequences important in transcription? (2 marks)

Q6. Given the DNA template strand sequence 3'-TACCGTAG-5', determine the mRNA sequence synthesized. (3 marks)

Q7. Describe how RNA polymerase recognizes where to stop transcription. (3 marks)

Q8. Compare the mechanisms of activator and repressor proteins in gene regulation. (4 marks)

Q9. Analyze the importance of transcriptional regulation in bacteria. (4 marks)

1. Transcription is the transfer of information from DNA to mRNA using RNA polymerase.

2. DNA-Double strand. RNA-Single strand.
DNA-Deoxyribose sugar. RNA-Ribose sugar.
DNA-Ademine, Thymine, Guanine, Cytosine. RNA-Adenine, Uracil, Guanine, Cytosine.

3.RNA polymerase

4. Sigma subunit recognizes two special sequences of bases in the coding (non-template) sequences known as the
region and the -35 region (promoter region). Sigma factor will disscociate to allow transcription process.

5. Consensus sequence act as recognition sites which guide RNA polymerase to the correct location on a DNA strand to begin transcription. -10: TATAAT -35: TGACA
Determine the strength of promoter recognition sequences Influence the efficiency of transcription.

6.5-AUGGCAUC-3'

mRNA sequences synthesis from 5' to 3. A-U &G-C.

7. A long stretch of A's in DNA becomes a line of U's at the endon mRNA. The line of U's tells the RNA polymerase to stop copying. The inverted repeats in the RNA fold back form stem and loop (hairpin) structure. This structure will cause the RNA polymerase to stop or slow down the transcription. The weak pairing of U-A will dissociate.

8. Activator increases Gene expression while repressor decreases gene expression.
Activators help RNA polymerase start transcription while the repressor blocks RNA polymerase from the transcribing genes.

9. Transcriptional regulation controlling when and how genes are expressed in a cell.
Example: housekeeping genes. Housekeeping genes used to maintain cellular processes.
The genes are turned on all the time, because their proteins are always needed.