Supplemental Instruction – Biology 2300

SI Leader – Philipp Orbe

Session: 7 – Transcription

1.Transcription is the process in which _____ polymerase uses one strand of _____ as a template to synthesize a complementary RNA sequence.

a. DNA; RNA
b. DNA; DNA
c. RNA; DNA
d. RNA; RNA

2.True or False: A cell can express different genes and translate mRNA at different rates.

a. What does this allow cells to do?

Gene regulation (controls how much and at which time genes are expressed)

3.The transcriptome is the entire mRNA content of the cell.

- Can its composition change over time? Why might it change?

Yes, it can turn genes on and off in order to silence or express them.

4.What are some differences between DNA and RNA, what unique qualities does each nucleic acid possess.

DNA is made up of deoxyribonucleic acids, RNA is made up of ribonucleic acids

DNA contains thymine while RNA contains uracil

DNA is double stranded and RNA is single stranded, this is a unique quality of RNA that allows it form intramolecular base pairs with itself.

5. What quality of RNA allows it to form intramolecular base-pairs (with itself).

Single Strands

6. True or False: The coding strand is identical to the RNA product. Why or why not?

The coding strand is made up of DNA, while the RNA product would contain uracil rather than thymine, meaning they are equivalent to one another but not IDENTICAL.

7. What similarities do DNA and RNA polymerase have, as well as what differences?

Both synthesize nucleotides in a 5-3 direction

DNA requires help from additional helicase and primase enzymes while RNA polymerase already has its own helicase activity and because of the extra oxygen on ribonucleotides it does not require a primer to initiate synthesis of the new strand.

8. True or False: Synthesis of the next RNA strand often occurs before the synthesis of the first strand is completed.

9. List the three main steps of transcription:

Initiation

Elongation

Termination

10. Promotor: a specific DNA sequence in DNA located near the start of a gene that is the binding site for RNA polymerase and the place where transcription starts.

11. How does RNA polymerase know where to start transcription?

a) Origin of transcription
b) Promotor region
c) Hormone release
d) RNA primase

12. In bacteria, RNA polymerase has a subunit for recognizing the promoter sequence of a gene, what is the subunit?

Sigma factor

13. True or False: Promoters and terminators work to orient RNA polymerase in one direction, only occurs in prokaryotes.

It occurs in both eukaryotes and prokaryotes.

14. RNA transcripts can be made from both/one strands of DNA. A specific gene is only transcribed off both/one strand.

Both strands of DNA contain nucleotides in which an RNA transcript can be made, that being said we know that they are COMPLEMENTARY which means that they are not identical. This means that a specific gene can only be found in one spot in the DNA and the complementary strand carries a different kind of gene.

15. Consensus sequence: a nucleotide sequence that represents an "average" of a number of a related but non-identical sequence.

16. Eukaryotic core promoters that recruit RNA polymerase ll consist of two elements. What are those two elements?

The TATA box

The initiator sequence

17. What are some differences between prokaryotic and eukaryotic transcription?

1. Prokaryotes have one RNA polymerase, eukaryotes have many.
2. Eukaryotes require assistance of transcription factors to bind to the promoter.
3. Eukaryotes contain large and varied regulatory sequences.
4. Eukaryotic transcription takes place in compact nucleosomes and chromosomes.

   Chromatin remodeling!!!

18. Initiation of transcription: Prokaryotes

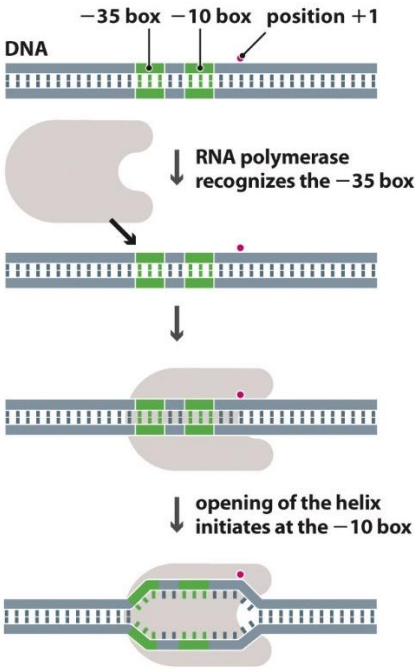

Figure 4.18 Introduction to Genetics (© Garland Science 2012)

19. Eukaryotic RNA polymerase requires general transcription factors to create a transcription initiation complex.

a. Transcription initiation complex includes:

Tata Binding Protetin (TBP)

TFllD and TFllB

20. TBP, TFllD, and TFllB recruit RNA polymerase II to the TATA box of the promoter.

21. RNA polymerase II is then released from the complex after being phosphorylated by TFllH.

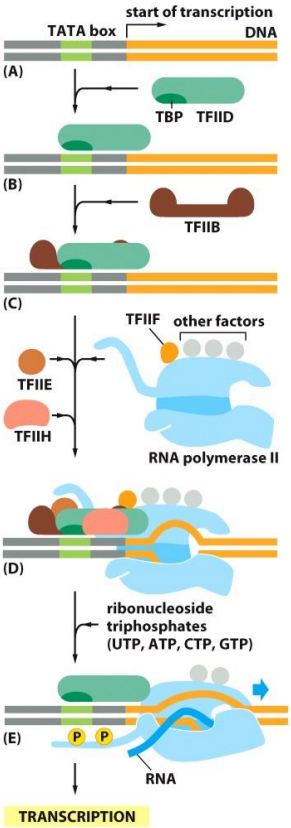

Figure 7-12 Essential Cell Biology, 4th ed. (© Garland Science 2014)