

- Auxotrophic mutation group 1 grows on minimal medium supplemented only by Y. Mutation group 2 grows on medium supplemented by W, X, or Y. Mutation group 3 grows on medium supplemented by W or Y but not X. What is the order of W, X, Y in the biological pathway?
 - $W \rightarrow X \rightarrow Y$
 - $W \rightarrow Y \rightarrow X$
 - $X \rightarrow W \rightarrow Y$
 - $Y \rightarrow W \rightarrow X$
- While the bases are normally _____, the sugar-phosphate backbone is normally _____.
 - Hydrophobic; hydrophilic
 - Hydrophilic; hydrophobic
 - Hydrophobic; hydrophobic
 - Hydrophilic; hydrophilic
- If there are 5,000 nucleotides in a sequence of DNA, how many base pairs are there?
 - 5,000
 - 2,500
 - 10,000
 - 3,000
- An inducible operon is normally _____, but can be turned _____.
 - On; on
 - On; off
 - Off; on
 - Off; off
- In what direction does RNA polymerase create a complementary mRNA transcript from a template strand of DNA?
 - 3'-5' **Read Template 3'—5'. Nontemplate is 5'—3' as well as the complementary transcript.**
 - 3'-3'
 - 5'-3'
 - 5'-5'
- Which of the following eukaryotic rRNA transcripts are encoded for on the large gene?
 - 28S
 - 18S
 - 5.8S
 - 5S

Euk: small subunit (18S) total 40S & large subunit (28, 5.8, 5S) total 60S= grand total 80S

Prok: small subunit (16S) total 30S & large subunit (23, 5S) total 50S= grand total 70S

- I only
- I and III only
- I, II, and IV only
- I, II, III, and IV

7. When does attenuation occur?
- a. When regions 1 and 2 form a hairpin.
 - b. When regions 2 and 3 form a hairpin.
 - c. When regions 1 and 2 form a hairpin, and 3 and 4 form a second hairpin.
 - d. When regions 2 and 3 form a hairpin, and 1 and 4 form a second hairpin.

8. It is possible for transcription and translation to occur at the same time.

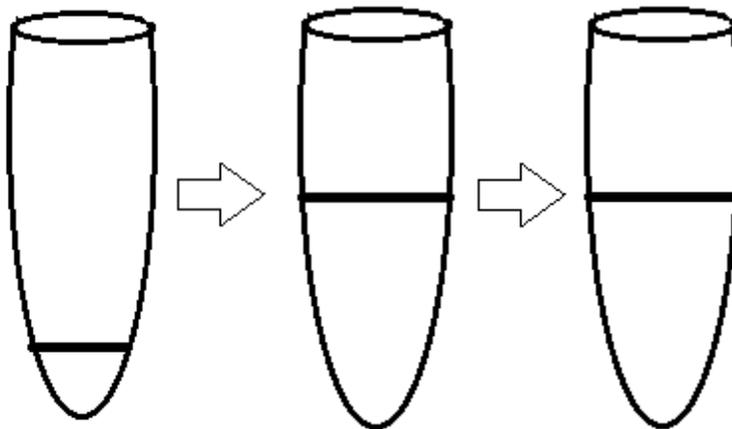
- a. True
- b. False **ONLY true in Prokaryotes**

9. Given a strand of DNA, choose its complimentary strand.

5'ACGTGC3'

- a. 5'TGCACG3'
- b. 5'GCACGT3' **Pay attention to which end is 5' and 3'**
- c. 5'GCGACG3'
- d. 5'TGCTCG3'

10. NASA has found a single-celled organism on Mars, which uses DNA as its genetic material. Although there is a chance that the organism replicates its genome in the same way that we earthlings do, there is also a chance that they may replicate their DNA by an entirely new mechanism. Given the tubes below (which have been centrifuged), and your knowledge of the Messelson-Stahl experiment, determine how DNA is replicated in this organism.



- a. Conservative Replication
- b. Semiconservative Replication
- c. Dispersive Replication
- d. Something new

11. In prokaryotes, what amino acid is attached to the tRNA molecule that is complementary to a start codon?

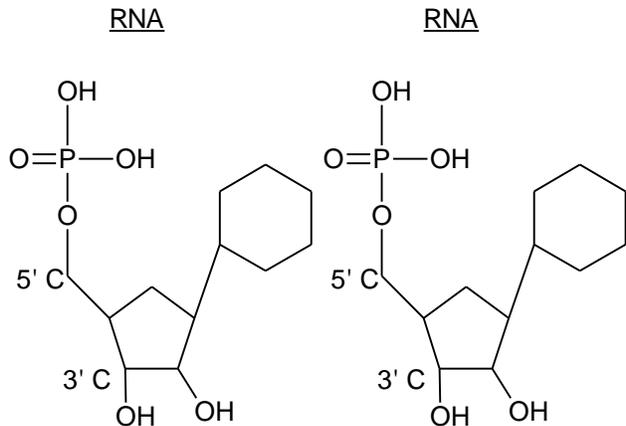
- a. Methionine **← Eukaryotes**
- b. Serine
- c. Adenine

d. Formylated methioning

12. When a mutation is considered trans acting, it _____.
- Effects genes located on the same chromosome.
 - Effects genes located on the sex chromosome.
 - Effects genes located on the same and on different chromosomes.
 - Effects genes located on the p-arm of a chromosome.
13. Which of the following sequences of RNA would form a stem?
- CCCCUAUA
 - AGUUAACU
 - CGUCCTCG ← no T in RNA
 - All of the Above
14. What is the function of DNA gyrase?
- Release the tension formed from the unwinding of the double helix.
 - Unwind the double helix to make the bases accessible.
 - Create short RNA primers.
 - Join the Okazaki fragments.
15. What is the total size of a eukaryotic ribosome?
- 40S
 - 60S
 - 70S
 - 80S
16. Which tRNA anticodon is complimentary to the codon UAA?
- AUU
 - TUU
 - CAA
 - None of the above ← it's a stop codon
17. What would happen if the σ (sigma) factor was nonfunctional?
- DNA polymerase will find the promoter faster.
 - The ribosome would not be able to find the start codon.
 - Transcription of a segment of DNA would be unable to happen.
 - Translation of a segment of mRNA would be unable to happen.
18. During translation, where does the first tRNA molecule bind in the ribosome?
- A-site ← 1st tRNA binds to P-site, all other tRNA bind to A-site
 - P-site
 - E-site
 - C-site
19. Which of the following is NOT transcribed in the mRNA transcript?
- Promoter
 - RNA coding region
 - Transcription termination sequence

- d. Stop codon
20. The lac operon is a good example of a(n):
- a. Negative repressible operon ←trp operon
 - b. Negative inducible operon
 - c. Positive repressible operon
 - d. Positive inducible operon
21. Which of the following CANNOT travel through the nuclear pores?
- a. mRNA
 - b. rRNA
 - c. tRNA
 - d. DNA
22. What would happen if the Shine-Dalgarno sequence was deleted from a molecule of mRNA?
- a. Transcription and translation would both occur.
 - b. Neither transcription nor translation would occur.
 - c. Transcription would still occur, but translation would not occur.
 - d. Transcription would not occur, but translation would occur.
23. How many aminoacyl-tRNA synthetases can be found in a cell?
- a. 1
 - b. 20
 - c. 61 ←# of tRNA molecules
 - d. 64 ←# of codons that code for an AA
24. The _____ form of DNA is most common under physiological conditions.
- a. A
 - b. B
 - c. Z
 - d. The A and B forms of DNA are equally common under physiological conditions.
25. In DNA methylation, which of the following bases is most commonly methylated?
- a. Adenine
 - b. Guanine
 - c. Cytosine
 - d. Thymine

26. Draw the molecular structure of DNA, including the three major components of DNA. Indicate which carbon the bonds occur between. Also indicate where the phosphodiester bond and H bonds occurs between. How is the molecular structure of RNA different from DNA.



Phosphodiester occurs between 3' and 5' of corresponding nt and H bond occurs between bases.

27. Indicate the importance of each of the following genes in the lac operon (Regulator of Prokaryotic transcription).

lacI- regulatory gene that Inhibits transcription by producing the regulator protein

lacP- promoter, a cis- acting regulatory element

lacO- operon, the region in which the regulatory protein binds and controls transcription

lacZ- gene that codes for protein

lacY – gene that codes for protein

28. Explain and then compare and contrast the two termination methods of prokaryotic transcription.

Rho-dependent termination has the string of AAAAs to slow down the RNA Polymerase. The rho factor then comes in and releases the RNA from the DNA.

Rho-independent termination has the tring of AAAAs to slow down the RNA Polymerase. A hairpin loop structure forms and creates instability that eventually releases the RNA from the DNA.

29. How do the mRNAs of bacterial cells and the pre-mRNAs of eukaryotic cells differ? How do the mature mRNAs of bacterial and eukaryotic cells differ?

- Bacterial mRNA is translated immediately upon being transcribed. Eukaryotic pre-mRNA must be processed. Both have 5'UTR and 3'UTR and protein coding regions. Eukaryotic protein coding region has introns whereas bacterial protein coding regions does not. Eukaryotic pre-mRNA must be processed to form mature mRNA.
- Mature mRNA consist of 5'cap, poly(a)tail, and spliced out introns.

30. List 3 major differences between the initiation of translation between prokaryotes and eukaryotes.

Prokaryotes	Eukaryotes
1 st AUG codes for formylated methionine	1 st AUG codes for methionine

Takes place within cytoplasm	Takes place within nucleus
Has Shine Delgarno Sequence	Has Kozak Sequence