

Exercises

Nucleic Acids

1. RBCs are produced from stem cells in the bone marrow. When RBCs mature, they discard their DNA and mitochondria to make room for more hemoglobin. Thus, they have no nucleus, no DNA, and do not divide.

a) What important biochemical reactions occur in mitochondria?

CAC, ETC/oxid phosphorylation

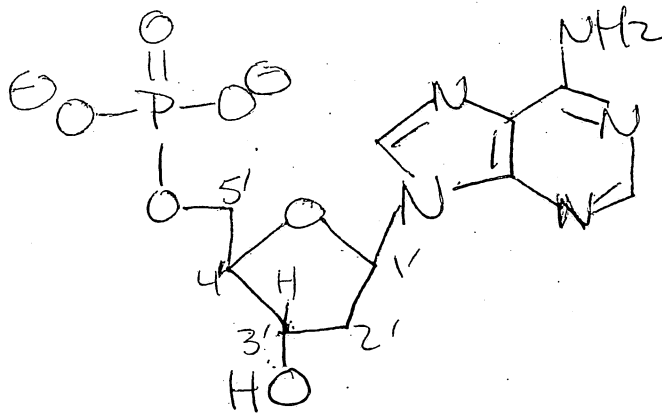
b) Without mitochondria, how can RBCs produce energy?

glycolysis in cytoplasm
(G → P)

2. What are the three basic building blocks of a nucleotide?

sugar, phosphate, base

3. Construct AMP from its 3 basic parts: phosphate, adenine, & deoxyribose.



4. In DNA,

a) what is the name of the sugar in the sugar-phosphate backbone?

2'-deoxyribose

b) where does the phosphate group bond to the sugar?

5'

c) what ^{are} the names of the four N-bases?

A-adenine T-Thymine G-guanine C-cytosine

d) where does the N-base attach to the sugar-phosphate backbone?

1'

5. In RNA,

a) what is the name of the sugar in the sugar-phosphate backbone?

ribose

b) where does the phosphate group bond to the sugar?

5'

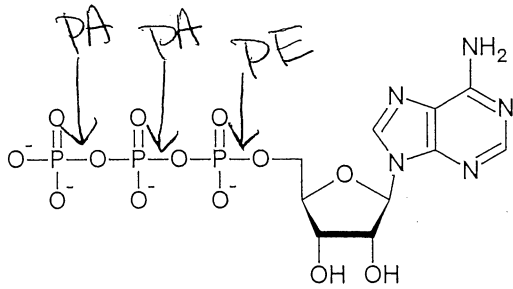
c) what is the name of the four N-bases?

A = adenine U = uracil G = guanine C = cytosine

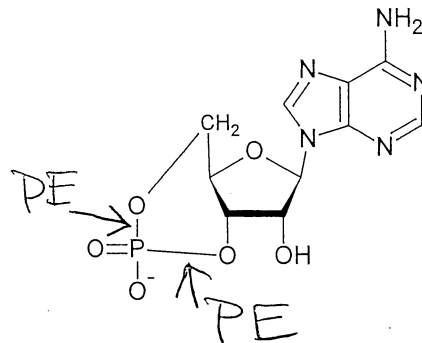
d) where does the N-base attach to the sugar-phosphate backbone?

1'

6. Point arrows to the phosphoesters bonds and label them "PE". Point arrows to the phosphoanhydride bonds and label them "PA" in the molecules below.



ATP (adenosine triphosphate)



cAMP (adenosine cyclic monophosphate)

7. In terms of DNA and RNA structure, what do the terms 3'-terminus and 5'-terminus mean?

The 5' end is considered the beginning of the nucleic acid. The 3' end is considered the end of the nucleic acid.

8. Briefly describe the primary, secondary, and tertiary structure of DNA.

1° = phosphoester bonds linking sugar & Pi to link nucleotide

2° = H-bonding btwn bases to create DNA double helix

3° = H-bonding btwn bases to create t-RNA loops
OR (structure)

Ch 15 Nucleic Acids - 15
nucleosomes, chromatin fibers, & chromosomes

9. What are the complimentary base pairs for DNA?

A T G C

10. What are the complimentary base pairs for RNA?

A U G C

11. What force holds the double stranded DNA together?

H-bonding

12. What are histones?

proteins that interact w/ DNA
to form nucleosomes

13. What are nucleosomes?

histone proteins wrapped w/ DNA

14. What is chromatin?

nucleosomes that have coiled
upon themselves

15. Salt bridges play a role in the interaction between DNA and histones. Which amino acids have side chains that can form salt bridges?

Asp, Glu, Lys, Arg, His

16. When DNA is denatured, which of the following is disrupted - primary, secondary, and/or tertiary structure? Hint: Apply your knowledge of protein structure.

2° &/or 3°

17. The primary structure of what molecule is read during each of the following processes?

a) DNA replication

DNA

b) Transcription

DNA

c) Translation

mRNA

18. Describe the translation process.

At the ribosome, mRNA is read & the matching tRNA brings the a.a. H-bonding allows tRNA & mRNA & ribosomes to interact so that the 2 aa can be linked together w/ a peptide (amide) bond. The tRNA is released & the next tRNA received to add another aa to the polypeptide. The process continues until a "STOP" codon.

19. Name and describe two types of mutations.

substitution: 1 aa is substituted for another b/c a nucleotide is subst.

frame shift: 1 nucleotide is lost causing changes to most subsequent aa's

20. Are all mutation harmful to an individual? Explain.

No, some mutations can offer an advantage to a changing environment.

21. Are all mutations passed on to offspring? Explain.

No, mutations can occur in cells after offspring were produced.