Freshman Biology Exam: DNA & RNA

NAME:\_\_\_\_\_\_\_\_ANSWER KEY\_\_\_\_\_\_\_\_\_

**Multiple choice: circle the best possible answer to the question provided.**

1. Each DNA nucleotide is comprised of :
   1. a deoyribose and a phosphate group
   2. a ribose and a phosphate group
   3. a deoxyribose, a phosphate group, and a nitrogenous base
   4. a ribose, a phosphate group, and a nitrogenous base
2. Generally speaking, DNA is found within the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and is in the form of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   1. Nucleus, double helix
   2. Mitochondria, double helix
   3. Chromosome, single strand
   4. Nucleus, single strand
3. mRNA is
   1. created during translation.
   2. a single stranded RNA molecule containing codons.
   3. a single stranded RNA molecule containing anticodons.
   4. a double helix.
4. Transcribe the following DNA strand into RNA

**ACTGC**

* 1. UGACG
  2. GAUCT
  3. TGACG
  4. ACTGC

1. A purine is
   1. A single ringed structure
   2. In DNA, not RNA
   3. Adenine
   4. Thymine

**Matching: match the word given on the left with the appropriate definition on the right. Not all answer choices will be used.**

1. The complimentary base for U on RNA A. CAU
2. RNA B. AUG
3. Start codon C. A
4. Holds the anticodon bases in translation D. Single stranded
5. The protein that DNA is coiled around E. double stranded

F. tRNA

G. rRNA

H. Histone

**Record answers for matching here:**

6. \_\_\_\_C\_\_\_\_\_\_ 7.\_\_\_\_\_\_D\_\_\_\_\_ 8.\_\_\_\_\_B\_\_\_\_\_\_ 9.\_\_\_\_\_F\_\_\_\_\_\_\_ 10.\_\_\_\_\_\_H\_\_\_\_\_

**True / False: circle true if the statement is COMPLETELY true. Circle false if there is one or more mistakes that makes the statement false.**

1. True/ False: a histone is negatively charged.
2. True/ False: the only difference between DNA and RNA is that DNA is double stranded and RNA is single stranded.
3. True/ False: point mutations are single nucleotide base changes in a gene’s DNA sequence.
4. True/ False: proteins are assembled on rRNA, a two subunit component that moves along the mRNA strands.

**Short answer:**

1. What is the process of replication and when does it occur in the central dogma? (give an example of this process using base pairs if it helps your explanation)

* Replication is the process where the DNA double helix unwinds and 2 complimentary strands of DNA are synthesized from each template strand. If the template strand read TACGTT, the complementary strand would read ATGCAA with the 5’ ends and 3’ ends in opposite directions. DNA replication is the first major step in the central dogma and occurs before transcription and translation.

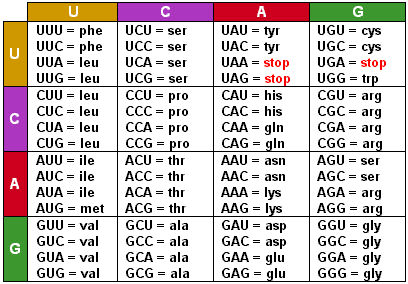
1. A DNA molecule reads: **5’ – ACTGCCAC – 3’** What would the complimentary sequence look like? (don’t forget to pay attention to the direction of the strand)

3’ –CGACGGTG – 5’

1. What is RNA editing? Explain the differences between introns and exons.

RNA editing is the splicing process where some of the material is cut out of the sequence. Introns are what are cut out; they are not necessary in the coding process for proteins. Exons are kept in the sequence because they are expressed in the synthesis of proteins.

**Use the codon/amino acid chart for questions 18-20.**



1. Given the following DNA sequence, determine the mRNA sequence and translated Amino acid sequence

|  |  |
| --- | --- |
| DNA | TAC GCA ATG GAC AGG |
| mRNA | AUG CGU UAC CUG UCC |
| Amino Acid | Met – arg–try- leu- ser |

1. Looking at the DNA sequence from 13A, what type of mutation would result if **ATG** (third grouping of bases) was mutated to **ATC**? How would this mutation affect the rest of the sequence? Explain.

DNA \_\_\_ATC\_\_

RNA\_\_\_UAG\_\_\_

Amino Acid\_\_\_Stop codon

This is a nonsense mutation and would stop the process of translation. The following amino acids would not be coded for and the protein would be shortened

1. If the codon for leucine **UUA** had a spontaneous mutation changing **UUA** to **UUG**, what would happen? What is this type of mutation called?

No change in the amino acid sequence would happen and there would be no affect on the person. This is a silent mutation and results in the change in a base that does not change the amino acid.