

Protein Synthesis Worksheet

1- Complete the tables below using the information learned above.

DNA strand	GTTACGGTTAGATTG
mRNA transcript	CAA UGC CAA UCU AAC
tRNA anticodons	GUU ACG GUU AGA UUG
Amino acid sequence	Gln - Cys - gln - ser - asn

DNA strand	TAC CAA GCA GTT CGG ACTG
mRNA transcript	AUGGUUCGUCAAGCCUGAC
tRNA anticodons	UAC CAA GCA GUUCGG ACU G
Amino acid sequence	start - val - arg - gln - ala - stop

2- Answer the questions using the following DNA sequence.

A A T G C C A G T G G T T C G C A C

a- Give the base sequence of the complimentary DNA strand.

T T A C G G T C A C C A A G C G T G

b- Give the mRNA strand that would be produced.

U U A C G G U C A C C A A G C G U G

c- Give the tRNA strand that would be produced. Place the appropriate AA above each anti-codon.

Leu Arg Ser Pro Ser Val
 AAU GCC AGU GGU UCG CAC

d- Give the amino acid sequence which will be produced.

Leu - Arg - Ser - Pro - Ser - Val

e- If the fourth nucleotide in the original DNA strand were changed from 'G' to 'C', would it change the protein produced? Explain.

Yes CCC = GGG as mRNA = gly GCC = CCG = Arg

f- If a 'G' were added to the original DNA strand after the third nucleotide, would different amino acids be produced? Explain.

Yes because different Codon produced = different AA.

g- Explain if it is guaranteed that the amino acid sequence will change if you replace a nitrogen base with another nitrogen base.

No, different codons will produce same AA.

3- Answer the questions using the following DNA sequence.

C A A A G G A T A T A C C A A T C C A G A A T G A T C

a- Make the mRNA strand.

GUU UCC UAU AUG GUU AGG UCU UAC UAG

b- Give the tRNA strand that would be produced.

CAA AGG AUA UAC CAA UCC AGA AUG AUC

c- Give the sequence of amino acids produced.

Val Ser Tyr Start - val - arg - ser - tyr - stop

4- Answer the questions using the following DNA sequence.

C G C A T C T A C G A T C G T A C T G C T G A A

a- Make the mRNA code using the above strand.

GCG UAG AUG CUA GCA UGA CGA CUU

b- Using the sequence from the mRNA, show the sequence of the AA which are produced.

ALA - stop start - leu - ala - stop arg leu

Multiple Choice

- Transcription is the first step of Protein Synthesis and it occurs in the
A) Ribosome B) Nucleus C) Cytoplasm D) Vacuole
- If a DNA sequence consists of 12 nucleotides, how many mRNA codons will there be?
A) 1 B) 2 C) 3 D) 4
- A DNA strand with the sequence AACGTAACG is transcribed. What is the sequence of the mRNA molecule synthesized?
A) AACGTAACG C) AACGUAACG
 B) UUGCAUUGC D) TTGCATTGC

4. Transcription is characterized by...
- A) a messenger RNA molecule synthesized from the DNA molecule in the nucleus.
 - B) a transfer RNA molecule synthesized from the DNA molecule in the nucleus
 - C) a ribosomal RNA molecule synthesized from the DNA molecule in the nucleus
 - D) the blueprint of the RNA molecule used to bind amino acids together to form proteins.
5. Translation is characterized by...
- A) a messenger RNA molecule synthesized from the DNA molecule in the nucleus.
 - B) a transfer RNA molecule synthesized from the DNA molecule in the nucleus.
 - C) a ribosomal RNA molecule synthesized from the DNA molecule in the nucleus.
 - D) the blueprint of the RNA molecule used to bind amino acids together to form proteins.
6. What is the correct amino acid sequence for the mRNA code
AUGCCAGUAUGA
- A) Met-Pro-Ala-Val
 - B) Met-Pro-Val-Stop
 - C) Tyr-Gly-His
 - D) Tyr-Gly-Arg-His
7. Which is the mRNA molecule that would be transcribed from this DNA template:
TGGCAAGTACGT
- A) ACCGTTTCATGCA
 - B) UGGCAAGUACGU
 - C) UCCGUUCUUGCU
 - D) ACCGUUCAUGCA
8. A change in one of the nucleotides of DNA results in
- A) translation
 - B) mutation
 - C) transcription
 - D) replication
9. A linear code of three sequential bases on one side of a DNA molecule is a --
- A) codon
 - B) gene
 - C) amino acid
 - D) base pair
10. The DNA sequence ATCAGCGCTGGC is part of a gene. How many amino acids are coded for by this message?
- A) 4
 - B) 8
 - C) 12
 - D) 20
11. DNA sequence is ACAGTGC. How would this be coded on mRNA?
- A) TGTCACG
 - B) UGUCACG
 - C) GUGACAU
 - D) CACUGUA
12. What is created during transcription?
- A) tRNA
 - B) DNA
 - C) mRNA
 - D) proteins
13. What happens during translation?
- A) mRNA is made from DNA
 - B) the ribosome uses information from mRNA to assemble proteins
 - C) tRNA is made from mRNA
 - D) copies of DNA molecules are made

14. A codon consists of how many nucleotides
A) 1 B) 2 **C) 3** D) 4

15. Translate the following: AUGCGCAAA
A) Met-Asp-Lys **C) Met-Arg-Lys**
B) Met-Arg-Pro D) Arg-Pro-Lys

16. One difference between DNA and RNA is that RNA....
A) is double stranded **C) contains the base Uracil**
B) contains the base Thymine D) contained the base Guanine

17. Cells are able to produce the proteins they need to properly function. Listed below are 4 steps involved in protein synthesis.

Steps	Protein synthesis process
1	Translation of mRNA into a protein
2	Genetic information of DNA copied to MRNA
3	End of protein synthesis
4	Attachment of MRNA to ribosome

Which of the steps above take(s) place in the cytoplasm of the cell?
A) 2 only B) 1 and 2 C) 2, 3 and 4 D) 1, 3 and 4

18. Which numbers are given in correct sequence to complete the sentence below?
'Of the _____ different possible codons, _____ specify amino acids, three of those being _____ signal stop.'
A) 20, 64, 3 B) 64, 17, 1 **C) 64, 20, 3** D) 64, 20, 1

19. Transcription and translation of a gene composed of 30 nucleotides would form a protein containing no more than _____ amino acids.
A) 10 B) 15 C) 60 D) 90

20. The codon read using the genetic code to determine the amino acid is found in
A) DNA **B) mRNA** C) tRNA D) rRNA

21. Put the following steps in order:
A- Codon meets its anticodon
B- DNA splits
C- Amino acids are joined together
D- mRNA is produced
E- A protein is created
F- mRNA travels to the ribosome area

B-D-F-A-C-E