Name Key Period _____

Ms. Foglia Date _____

AP: CHAPTER 17: FROM GENE TO PROTEIN

1. How did diseases involving metabolic pathways lead to hypotheses about the nature of genes?

hypothesis that symptoms of an inherited disease reflect a person's inability to make a particular enzyme

2. Identify some genetic diseases that occur along metabolic pathways.

albinism, diabetes, adrenoleukodystrophy

menkes syndrome

3. What was Beadle and Tatum's hypothesis regarding enzymes? "one-gene-one-enzyme"

function of a gene is to dictate the production of a certain enzyme

4. How has that hypothesis been modified? "one-gene-one-polypeptide"

non-enzymes, proteins made of several polypeptide chains

5. What occurs during transcription?

DNA is transcribed onto the messenger RNA

6. What occurs during translation?

messenger RNA is read to build proteins

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7. How does the protein process differ in prokaryotes and eukaryotes?

prokaryotes - no nucleus; so translation can begin while transcription is occurring

8. Briefly explain how Marshall Nirenberg and Heinrich Matthaei "cracked the genetic code?"

artificial system to decode/decipher codons - found that "UUU" codes for phenylalanine

9. What is the genetic code and why is said to be universal?

amino acids coded for by certain codons, shared by organisms from simplest bacteria to most complex organisms

10. List several features about the genetic code.

universal, some redundancy but no ambiguity

11. Give an example of what happens if reading frames are altered?

proteins are not synthesized properly (mutated)

12. List the highlights of the three stages of transcription.

a. Initiation transcription start point "promoter" (TATA box) * transcription initiation complex (transcription factors, promoter, RNA polymerase)

b. Elongation RNA polymerase moves along DNA, untwisting it and adding nucleotides to the 3' end of the RNA molecule

c. Termination bacteria - termination signal, eukaryotes - polyadenylation signal (AAUAAA)

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13. What happens to the transcript RNA before it leaves the nucleus?

it has to be processed - the ends have to be altered (5' cap, poly-A tail)

14. What is the advantage of the 5' cap and poly A tail?

- facilitate the export of mature mRNA from the nucleus
- help protect the mRNA from degradation
- help ribosomes attach to the 5' end of the mRNA

15. Distinguish between exons and introns.

introns - non coding regions that between coding regions

exons - coding regions that are expressed

16. Describe the mechanism for splicing RNA.

snRNPs recognize splice site, several snRNPs form a spliceosome

17. What does alternative RNA processing do for cells?

a single gene can encode for more than one kind of polypeptide

18. Identify the roles of the players of the translation process.

a. Transfer RNA transfers amino acids from the cytoplasm to the growing polypeptide in a ribosome

b. Aminoacyl-tRNA synthetase enzymes that match the tRNA to the amino acid

c. Ribosomes facilitate the coupling of tRNA anticodons to mRNA codons

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19. Identify and briefly describe the steps of translation. Initiation Elongation Termination
Initiation -
start codon "AUG"; translation initiation complex formed
elongation - bases read 5'→3'; amino acids added
termination - stop codon; release factor

20. What is the advantage of polyribosomes?

enable a cell to make many copies of a polypeptide very quickly

21. Give an example of how a polypeptide gets into the ER for additional processing.

signal peptide - targets a protein for the ER, SRP brings ribosome to a receptor protein in the ER membrane

22. How does protein synthesis differ between prokaryotes and eukaryotes?

prokaryotes - can occur same time as transcription
eukaryotes - transcription 1st translation in cytoplasm

'introns + exons'

23. Define point mutations. change in a single nucleotide pair of a gene

24. Define mutations that are:

a. Missense substitution that changes one amino acid to another (can have minimal effect)

b. Nonsense substition that changes an amino acid to a stop codon; terminates early; nonfunctional

c. Insertion or deletion addition or losses of nucleotide pairs; greater impact than substitutions - cause frameshifts

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25. Use the diagram to trace the flow of chemical information from the gene to the protein product.