

Name _____ Block _____ Date _____

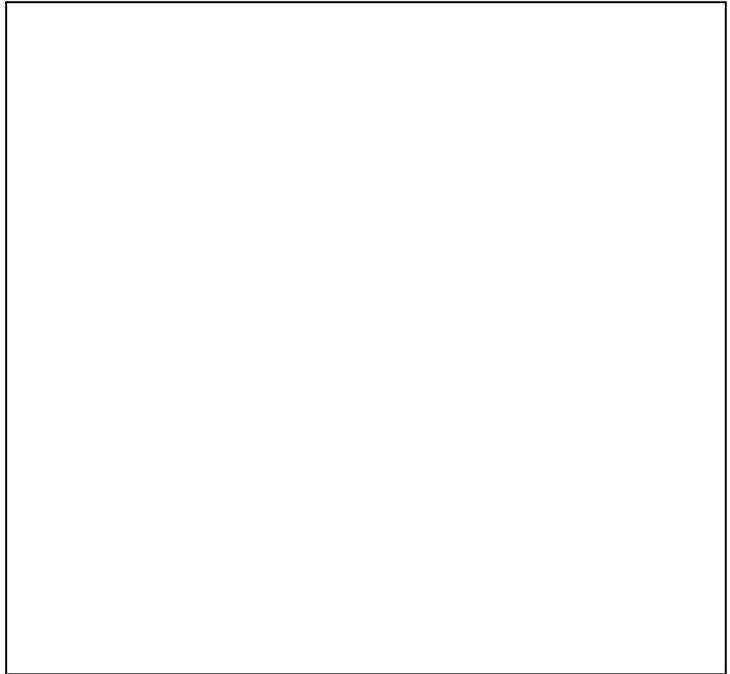
Test 7 Study Guide: Molecular Genetics (BIO.5e-j)

1. Review the last page of your Test 6 Study Guide (specifically, the material on DNA).

2. Write the complimentary base sequence: G A A C A T

3. Draw a DNA double strand that is at least 4 nucleotides long. Label:

- a. a phosphate group
- b. a deoxyribose sugar
- c. a strong covalent bond
- d. the sugar-phosphate backbone
- e. a nitrogen base
- f. a nitrogen base pair
- g. a weak hydrogen bond
- h. a nucleotide



4. Describe Chargaff's Ratios.

The amount of thymine always equals the amount of _____.

The amount of cytosine always equals the amount of _____.

The amounts of all 4 bases added together should always equal _____.

5. If a DNA sample contains 20% guanine, how much of the other three bases will it contain?

a. cytosine _____

b. adenine _____

c. thymine _____

6. Identify the cellular structure that holds DNA in eukaryotes. _____

7. Identify the part of the cell cycle in which DNA is replicated. _____

8. Explain why a cell replicates its DNA (hint: It is getting ready to do something.) and why it is important for the DNA to be copied exactly.

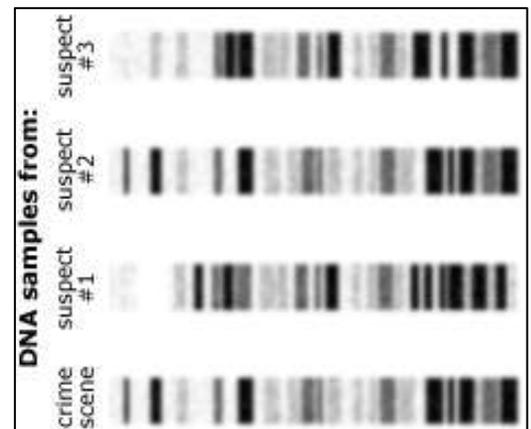
9. Draw or describe the process of DNA replication in 3 steps. Include the roles of **helicase** and **DNA polymerase**.

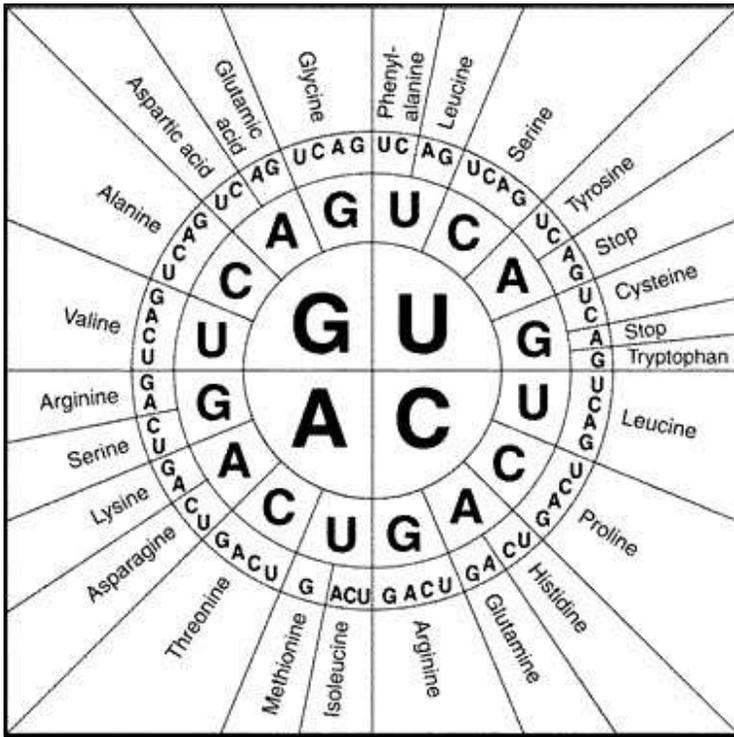
10. Describe each form of genetic technology.

| Genetic Tech | Description | Example or Application |
|---------------------------------------|-------------|------------------------|
| DNA Fingerprinting | | |
| Recombinant DNA (genetic engineering) | | |
| Cloning | | |
| DNA Sequencing | | |

11. Explain why it is possible to insert foreign DNA into an organism and have that organism “use” the DNA (e.g. recombinant DNA, GMOs, gene therapy)

12. Identify which suspect’s DNA was found at the crime scene, and explain why you know this.





| | | Second Base | | | | |
|------------|---|--------------------------|--------------------------|----------------------------|---------------------------|------------------|
| | | U | C | A | G | |
| First Base | U | Phe Phe Leu Leu | Ser Ser Ser Ser | Tyr Tyr Stop Stop | Cys Cys Stop Trp | U C A G |
| | C | Leu Leu Leu Leu | Pro Pro Pro Pro | His His Gln Gln | Arg Arg Arg Arg | U C A G |
| | A | Ile Ile Ile Met | Thr Thr Thr Thr | Asn Asn Lys Lys | Ser Ser Arg Arg | U C A G |
| | G | Val Val Val Val | Ala Ala Ala Ala | Asp Asp Glu Glu | Gly Gly Gly Gly | U C A G |
| | | | | | | Third Base |

Complete both tables below. Use either of the codon charts shown above to complete the amino acid sequence.

Gene #1 Fragment

| | |
|-----------------------|-------------------------------------|
| Template DNA sequence | T A C G C G C C T A G G G G G T G G |
| mRNA sequence | |
| Amino acid sequence | |

Gene #2 Fragment

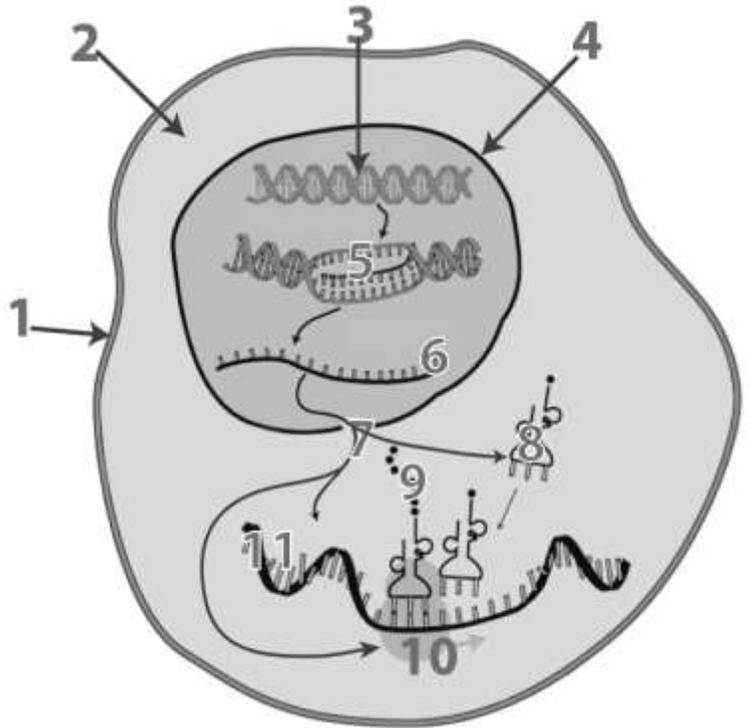
| | |
|-----------------------|-------------------------------------|
| Template DNA sequence | |
| mRNA sequence | A A G C U A A U C U A C G G C U U C |
| Amino acid sequence | |

- How many codons are in each of the mRNA sequences shown above? _____
- How are mRNA and template DNA related? (hint: The rules you follow to make mRNA from DNA) _____
- What would be the anticodon sequence for Gene #2 Fragment?

Use the following word bank to identify the structures labeled in the cell at right.

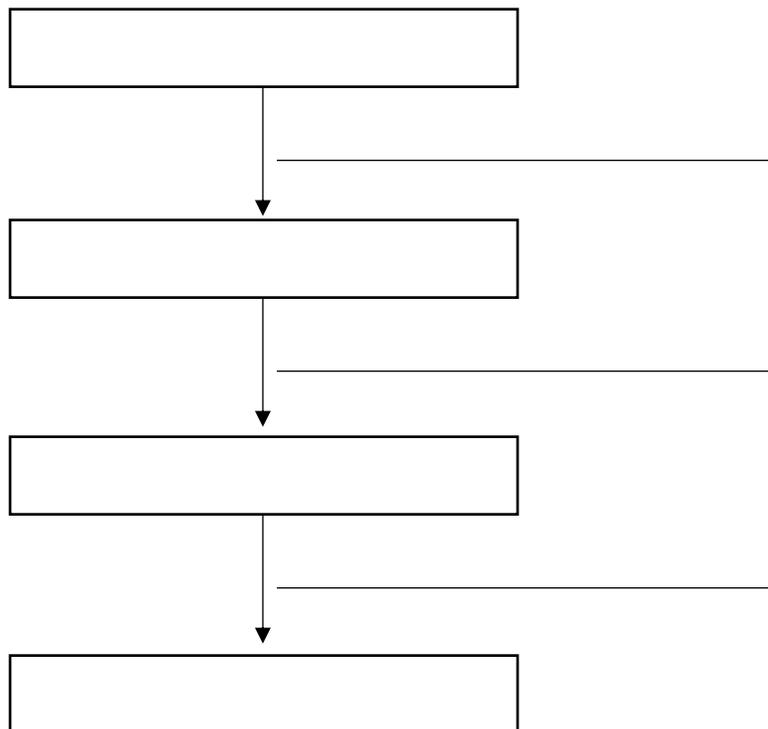
| | |
|-----------------------|---------------|
| Polypeptide (protein) | Cell membrane |
| Cytoplasm | DNA |
| Leaving nucleus | mRNA |
| mRNA | ribosome |
| transcription | translation |
| tRNA | nucleus |

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____



Use the following word bank to complete the flow chart at right.

| |
|----------------|
| Cell processes |
| DNA |
| Genetic trait |
| Protein |
| RNA |
| Transcription |
| Translation |



Fill in the blanks below to summarize the process of gene expression through protein synthesis using the following word bank.

| | | | | | | |
|----------------|------------------|-------|-----------|---------|----------------|----------|
| amino acids | amino acid chain | DNA | anticodon | mRNA | RNA polymerase | tRNAs |
| genetic traits | cell functions | codon | protein | nucleus | cytoplasm | ribosome |

- In transcription, _____ is copied by the enzyme _____ to make _____.
- After mRNA is made in the _____, it travels to the _____.
- In translation, _____ binds to the _____ organelle, which reads the 3-nucleotide _____.
- _____ carry _____ to the ribosome. _____ on the tRNA must be complimentary to the codons on the mRNA.
- An _____ is built, eventually falls off, and folds up to form a _____.
- Proteins perform _____ which produce _____.

Use the terms below to compare RNA and DNA by completing the following box-and-t chart.

| | | | |
|-----------------|---------------------|--------------------------------------|-------------------|
| made in nucleus | remains in nucleus | moves to cytoplasm | adenine |
| cytosine | guanine | thymine | uracil |
| single-stranded | double-stranded | self-replicates before cell division | deoxyribose sugar |
| ribose sugar | made of nucleotides | types of nucleic acid | genetic info |

| | |
|---|---|
| Both DNA and RNA... | |
| <ol style="list-style-type: none"> are _____ contain _____, _____, _____ are _____ are _____ carry _____ | |
| Only DNA... | Only RNA... |
| <ol style="list-style-type: none"> _____ contains _____ is _____ _____ contains _____ | <ol style="list-style-type: none"> _____ contains _____ is _____ contains _____ |

Answer the following questions.

- What is a mutation? _____

- How can a “silent mutation” occur? _____

- How can mutations be passed on from parents to offspring? _____

Complete the following chart

| Mutation type | Description | Cause (When does it occur?) |
|----------------------|-------------|-----------------------------|
| Point mutation | | |
| Chromosomal mutation | | |

Describe or identify an example of each of the following:

- Harmful mutation _____
- Lethal mutation _____
- Beneficial mutation _____

Observe the genotype at right.

- Identify the gender: _____
- Draw a circle around where you found this information.
- Describe any chromosomal abnormalities:

- Draw a square around where you found this information.

