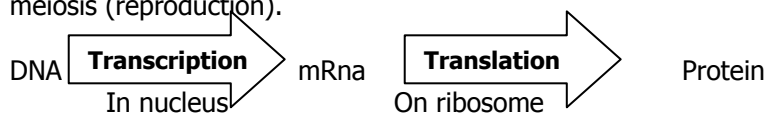


12 Weeks to TAKS: Week 9 TEACHER DOCUMENT

Remember THIS?

Making a DNA copy of DNA is **replication**. Cells need to copy their DNA for mitosis (growth, repair, and maintenance) and meiosis (reproduction).



REPLICATION : A matches with T and G matches with C

TRANSCRIPTION: A matches with U and G matches with C

TRANSLATION: Use a chart to decode every three mRNA bases to see what amino acid the tRNA's will carry in to build a protein.

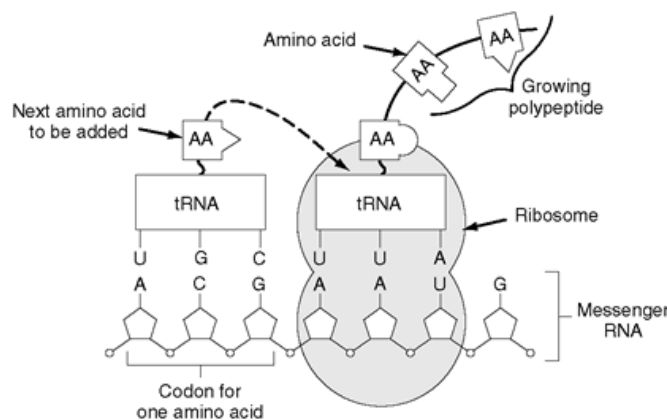
MUTATION: Any change in the DNA sequence. If it is a point mutation (one letter is changed), it can change the amino acid sequence by changing the code.

TEACHER NOTES: When DNA is replicated, a complementary strand is formed. Its base pairs match the original strand according to the following base pairing rules: Adenine (A) pairs with Thymine (T) and Guanine (G) pairs with Cytosine (C). The order of these amino acids determines the structure of the protein. The structural and enzymatic proteins create the traits we inherit from our parents. Protein Synthesis (translation) occurs at the ribosome. A copy of single stranded mRNA that has been copied from the DNA is placed in a ribosome and decoded into a protein. Every three bases ("letters") of the mRNA, called a codon, code for one amino acid. This happens when complementary tRNA's carrying amino acids come to the ribosome and base pair with the mRNA. Peptide bonds form between the amino acids causing a polypeptide to form. Students must understand the concept that mRNA is translated into amino acids in groups of three called codons. An amino acid chart is used to decode each group of three letters into its corresponding amino acid. If a change occurs in the mRNA (a mutation) the amino acid can change, possibly causing a malformed protein to be formed.

Sample Taks Questions:

Circle the correct answer.

1. Which cellular function does this model represent?



Right Answer:

B Protein synthesis

Wrong Answers:

- A** Respiration
- C** DNA replication
- D** Photosynthesis

Why?

When mRNA is being read and a polypeptide is forming at the ribosome, protein synthesis is taking place.

Why?

- A. Respiration is the process of making ATP from the chemical energy stored in food. It occurs in the Mitochondria.
- C. DNA replication is when an exact copy of DNA is made from an existing DNA molecule. This happens in the nucleus.
- D. Photosynthesis is the process of making sugar from the sun's energy. It occurs in the chloroplast.

Codon Chart

		Second Position				
		U	C	A	G	
First Position (5')	U	Phenylalanine Phenylalanine Leucine Leucine	Serine Serine Serine Serine	Tyrosine Tyrosine Stop Stop	Cysteine Cysteine Stop Tryptophan	U C A G
	C	Leucine Leucine Leucine	Proline Proline Proline	Histidine Histidine Glutamine Glutamine	Arginine Arginine Arginine Arginine	U C A G
	A	Isoleucine Isoleucine Isoleucine Methionine	Threonine Threonine Threonine Threonine	Asparagine Asparagine Lysine Lysine	Serine Serine Arginine Arginine	U C A G
	G	Valine Valine Valine Valine	Alanine Alanine Alanine Alanine	Aspartic acid Aspartic acid Glutamic acid Glutamic acid	Glycine Glycine Glycine Glycine	U C A G

5' AGAUCGAGU 3' → 5' ACAUCGAGU 3'

2. The chain above represents three codons. Which of the following changes would be expected in the amino acid chain if the mutation shown above occurred?

<p>Right Answer: G The identity of one amino acid would change.</p>	<p>Why? Changing the G to a C in the first codon changes the amino acid from arginine to threonine.</p>
<p>Wrong Answers: F The amino acid sequence would be shorter than expected. H The amino acid sequence would remain unchanged. J The identities of more than one amino acid would change.</p>	<p>Why? F a point mutation doesn't shorten the length of an amino acid chain unless it codes for a stop codon. H the mutation changes the sequence. J Only one of the codons is affected by the mutation.</p>

3. If the template of a strand of DNA is 3_5 AGATGCATC 3 , the complementary strand will be —

<p>Right Answer: F 3_5TCTACGTAG5</p>	<p>Why? This is the only choice that follows the base pairing rules and therefore is a correct match to the parent strand.</p>
<p>Wrong Answers: G 5_3CTACGTAGA3 H 3_5AGATGCATC5 J 5_3AGACGTCTA3</p>	<p>Why? The first A in the parent strand must match with a T in the complementary strand.</p>

4. If a cat has 38 chromosomes in each of its body cells, how many chromosomes will be in each daughter cell after mitosis?

<p>Right Answer: H 38</p>	<p>Why? If a cat cell started with 38 chromosomes, after mitosis, both daughter cells will be exact copies that contain 38 chromosomes.</p>
<p>Wrong Answers: F 11 G 19 J 76</p>	<p>Why? Students might guess G (19) because meiosis produces sex cells with half of the genetic information as the parent cell. They could also be confused with fertilization, which would double the genetic information when two sex cells meet. In this case, they would have chosen J (76).</p>

5. In DNA, which of the following determines the traits of an organism?

Right Answer:	Why?
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H Sequence of nitrogen bases	A,T,G, and C form the genetic code that is translated into proteins
Wrong Answers: F Amount of adenine G Number of sugars J Strength of hydrogen bonds	Why? F. all bases (A,T,G, and C) form the code G. The sugar ribose is part of the backbone of DNA, but it isn't involved in the code. H. Hydrogen bonds hold the two strands of the DNA together between the bases. Their strength does not affect the code.

6. DNA molecules separate into single strands, which are then used to construct two identical strands of DNA. This process ensures that the —

Right Answer: D daughter cells are genetically identical to the parent cells *	Why: Replication of the parent DNA strand into two identical daughter strands ensures that one exact copy of all of the cell's instructions will be available for each new daughter cell after mitosis occurs.
Wrong answers: A cytoplasm is in equilibrium	Why: Cell plate regrowth in plant cells and cytokinesis in animal cells assures cytoplasm is equal in the daughter cells. This is not part of the role of DNA replication.
B mitochondria are genetically identical to the chloroplasts	Mitochondria and chloroplasts have their own separate loops of DNA which are not identical. Also, the DNA strands involved in replication are nuclear DNA.
C parent cells use little ATP	Although ATP is used in the process, energy conservation is not the function of replication.

7. Ultraviolet radiation can cause mutations in the DNA of skin cells that have been overexposed to the sun. This mutated DNA has no effect on future offspring because —

Right Answer: D only changes to gamete DNA can be inherited*	Why: This statement is correct. Only mutations in gametes (sex cells) are passed on to offspring. A mistake in the DNA code in one skin cell only affects that cell and its daughter cells by mitosis.
Wrong answers: A changes in skin cell DNA are homozygous recessive	Why: Mutations are changes in the sequence of base pairs in the DNA molecule. There is no guarantee that mutations will be dominant or recessive. In fact, the term "homozygous recessive" refers to what would happen if two copies of a mutated gene were present in a cell. In a skin cell where the mutation occurred, this is not the case.
B mutations must occur within the RNA codons	Mutations effect DNA, not RNA. However, mutations must occur with the DNA coding region for mRNA codons to affect the skin cell. They would not affect offspring unless they were passed on in a gamete (sex cell).
C offspring reject parental skin cells	Off spring don't get their parent's skin cells.

Quiz Answers:

1. B
2. D
3. A
4. C
5. D