

Test 5 – DNA and Cell Division

For questions 1 – 26, choose the one option that best answers each question or completes each statement.



1. The picture shows an x-ray diffraction of DNA. The x-ray diffraction of DNA led to the idea that DNA —

- a. is a very long molecule
- b. can copy itself
- c. contains paired bases
- d. is a double helix

2. Tissue samples taken from the heart and stomach of a grasshopper would be expected to have the same —

- a. metabolic rates
- b. cell shape
- c. DNA
- d. cell size

3. Which two scientists are mainly credited with figuring out the shape and structure of the DNA molecule?

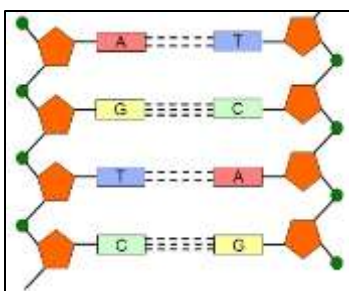
- a. Crick and Hook
- b. Crick and Watson
- c. Mendel and Darwin
- d. Watson and Darwin

4. DNA is a polymer made of a double strand of monomers called _____.

- a. amino acids
- b. fatty acids
- c. monosaccharides
- d. nucleotides

5. During DNA synthesis, a double-stranded molecule of DNA is copied to produce two identical copies of the original strand. Which of the following molecules is *not* immediately necessary for this process to occur?

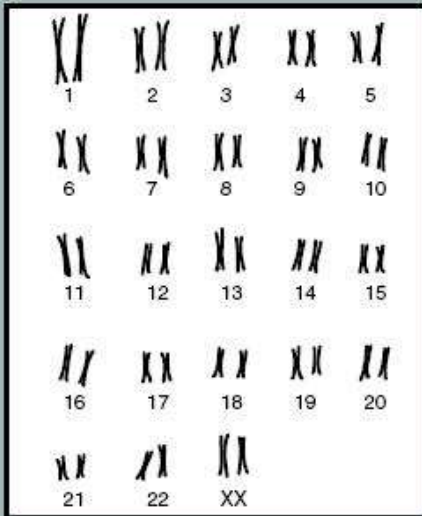
- a. ATP
- b. Enzymes
- c. Free nucleotides
- d. Lipids



6. Complimentary nitrogenous base pairs in a DNA molecule are held together by _____.

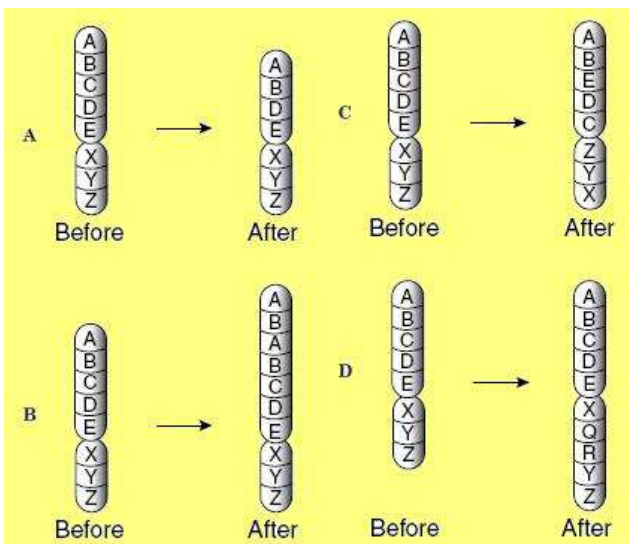
- a. strong covalent bonds
- b. strong metallic bonds
- c. weak hydrogen bonds
- d. weak ionic bonds

Human Karyotype



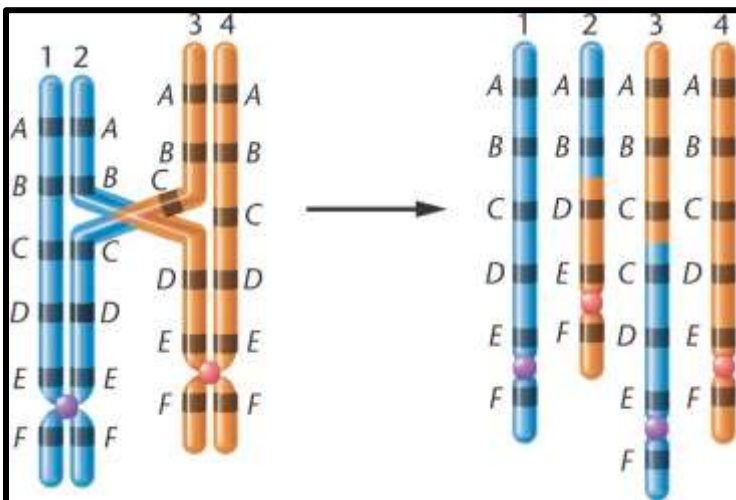
7. A chart of human chromosome pairs is called a karyotype. The karyotype shown here reveals that this person _____.

- has Down Syndrome
- has Sickle Cell Anemia
- is a man
- is a woman



8. Inversions in chromosomes occur when part of a chromosome breaks out and is reinserted upside down. Which of the diagrams below represents an inversion?

- A
- B
- C
- D



9. During crossing-over of meiosis, one chromosome in a homologous pair receives more DNA than it trades to its homologous partner. This event could most likely result in what type of chromosomal mutation?

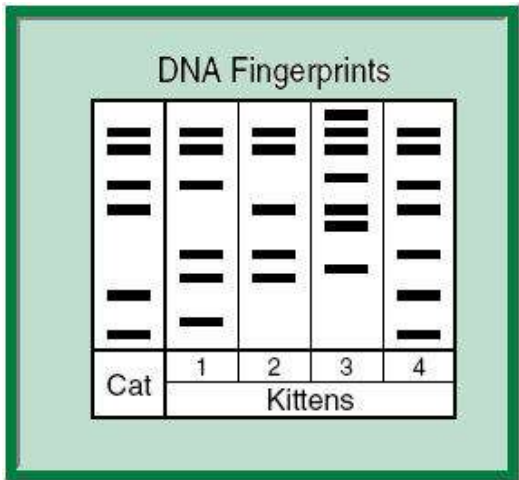
- Deletion of a gene
- Duplication of a gene
- Translocation of a gene
- Both A and B

10. Which of these is most responsible for carrying coded information from the nucleus?

- a. mRNA
- b. The ribosomes
- c. ATP
- d. The cell membrane

11. The triplet code of bases for RNA may be represented by all of the following except —

- a. CGG
- b. CGT
- c. CGU
- d. CGA



12. The picture shows a segment of DNA from a cat. Which of these is most likely the kitten of this cat?

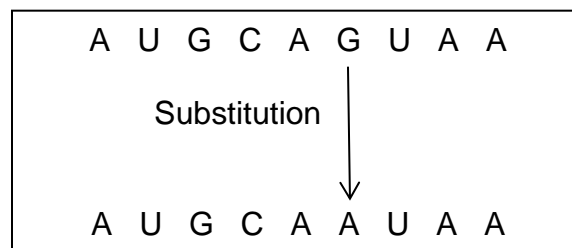
- a. 1
- b. 2
- c. 3
- d. 4

		Second Base				
		U	C	A	G	
U		Phe	Ser	Tyr	Cys	U
		Phe	Ser	Tyr	Cys	C
		Leu	Ser	stop	stop	A
		Leu	Ser	stop	Trp	G
C		Leu	Pro	His	Arg	U
		Leu	Pro	His	Arg	C
		Leu	Pro	Gin	Arg	A
		Leu	Pro	Gin	Arg	G
A		Ile	Thr	Asn	Ser	U
		Ile	Thr	Asn	Ser	C
		Ile	Thr	Lys	Arg	A
		Met	Thr	Lys	Arg	G
G		Val	Ala	Asp	Gly	U
		Val	Ala	Asp	Gly	C
		Val	Ala	Glu	Gly	A
		Val	Ala	Glu	Gly	G

Genetic Code for Amino Acids

13. According to this table, a codon AGC is the code for which amino acid?

- a. Cysteine (Cys)
- b. Leucine (Leu)
- c. Serine (Ser)
- d. Tyrosine (Tyr)

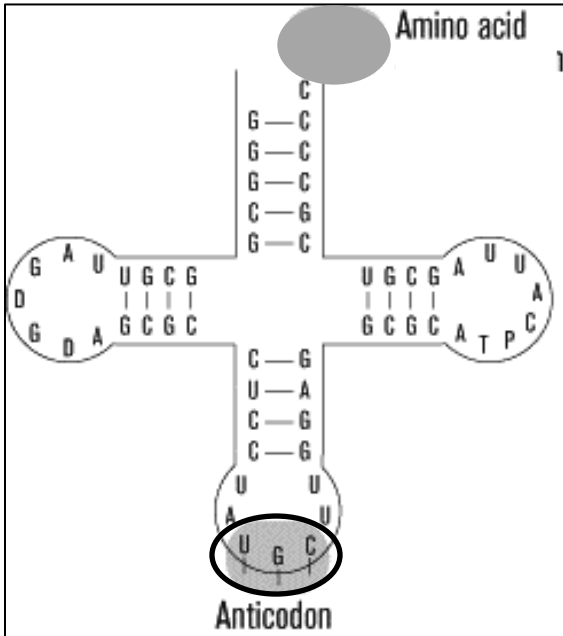


14. A substitution mutation is shown above. According to the codon chart, which of the following best describes the result of this mutation?

- a. Amino acid substitution (missense)
- b. Change in the reading frame (frameshift)
- c. Early stop to translation (nonsense)
- d. No change to the amino acid sequence (silent)

15. How is it possible that a scientist can insert a human gene into a bacterial cell and expect the bacterium to produce the human protein?

- Bacteria contain the same genes as humans.
- The bacterium must be modified first in order to recognize the human genetic code.
- The human gene must first be revised to match the bacterial genetic code.
- The genetic code is universal to all known forms of life.



16. A transfer RNA molecule is shown at left. To which of the following codons on an mRNA molecule could it complimentary bind during protein synthesis?

- ACG
- CGU
- TCG
- UGC

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

17. Identify the number of codons contained in the mRNA sequence shown above.

- 1
- 5
- 14
- 15

For the following question, more than one answer choice is correct. Choose all correct answers.

18. Which two of the following are differences between DNA and RNA?

- Only DNA is a nucleic acid.
- Only DNA is made in the nucleus.
- Only DNA contains thymine (T).
- Only RNA is single stranded.
- Only RNA contains adenine (A).

For the following questions, answer directly on this test according to the directions provided.

19. A DNA sample contains 30% adenine (A). How much cytosine is expected to be found in this same sample based on this information? Write your answer as a whole number in the space provided:

_____ %

20. Write the DNA sequence that is complementary to the DNA sequence provided below:

C T T T C G A

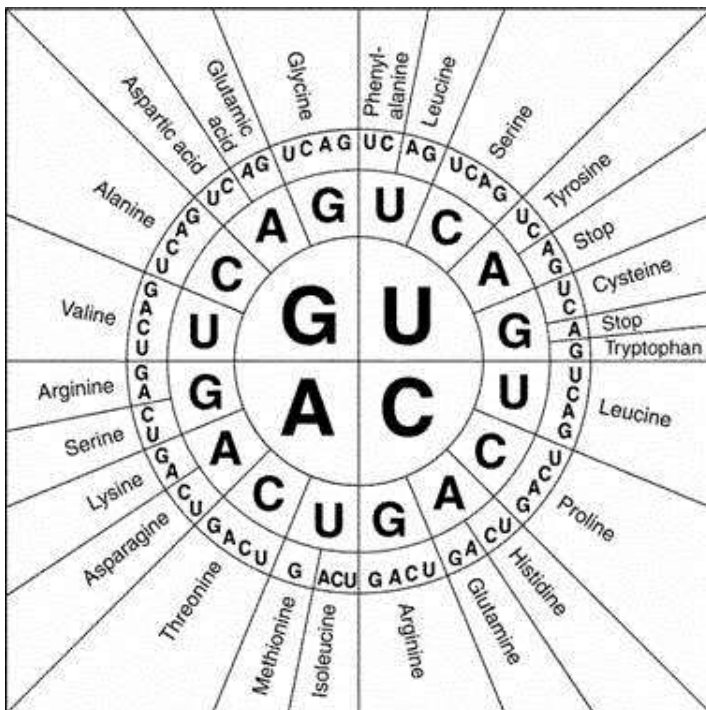
21. The Central Dogma describes the pathway of molecular information in the cell from storage to expression. Rewrite the following terms on the line provided in the correct chronological order of molecules or processes in this pathway.

Word Bank: DNA protein RNA transcription translation

Begin _____ → _____ → _____ → _____ → End

22. Write the mRNA sequence that is complementary to the template DNA sequence provided below:

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



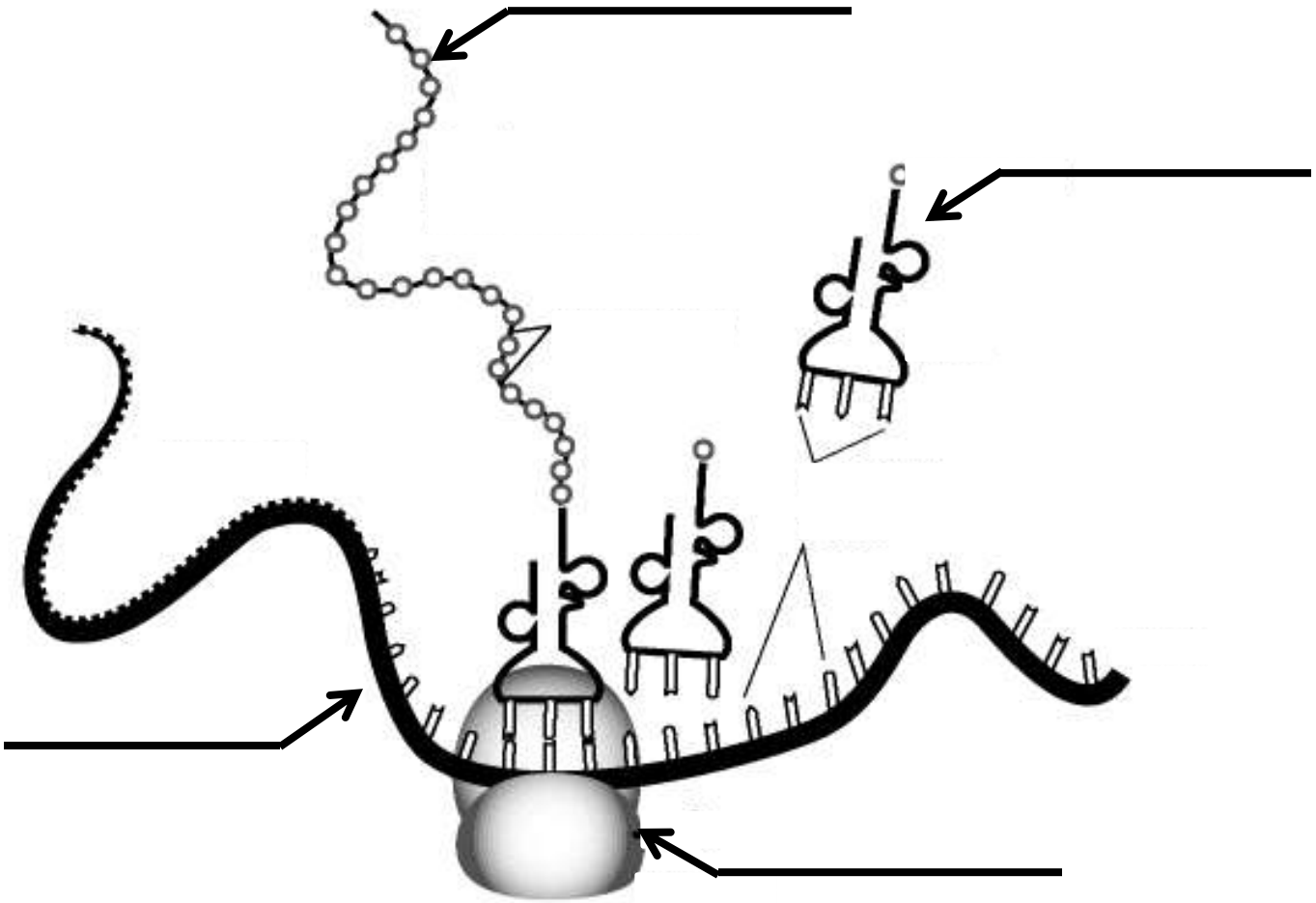
23. Given the following mRNA sequence and the chart above, write the corresponding amino acid sequence on the space below (beginning with the first nucleotide, reading the mRNA from left to right):

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

24. Explain how a gene produces the appearance of a physical trait in an organism.

25. Label the diagram of translation below using words from the word bank. Not all words will be used.

amino acid chain
DNA
mRNA
RNA polymerase
ribosome
tRNA



26. Choose one of the genetic technologies listed below. Describe the technology (make sure you indicate which one you're writing about) and explain how it can help human society.

DNA Fingerprinting Cloning Genetic engineering Human Genome Project
