Multiple Choice Review- Genes

1. Deoxyribonucleic acid nucleotides are composed of
    a. Ribose sugar, a phosphate group and one of four bases (adenine, cytosine, thymine and guanine)
    b. Ribose sugar, a phosphate group and one of four bases (uracil, cytosine, thymine and guanine)
    c. Deoxyribose sugar, a phosphate group and one of four bases (uracil, cytosine, thymine and guanine)
    d. Deoxyribose sugar, a phosphate group and one of four bases (adenine, cytosine, thymine and guanine)

2. When the bases "pair up" to connect one strand of DNA to a "mirror image" strand of DNA, why do the bases pair up in specific pairs?
    a. A purine must pair with a pyrimidine because of the number of hydrogen bonds between them
    b. A purine must pair with a purine because of the number of hydrogen bonds between them.
    c. A purine must pair with a pyrimidine because of the number of carbon bonds between them
    d. A purine must pair with a purine because of the number of carbon bonds between them.

3. If the function of DNA is to contain the code of the genetic information for the cell, where do we find this code?
    a. The code is the sequence of phosphate groups.
    b. The code is the sequence of bases combined from both strands of DNA
    c. The code is the sequence of bases on one strand of the DNA.
    d. The code is the sequence of sugars found in the protected backbone of DNA.

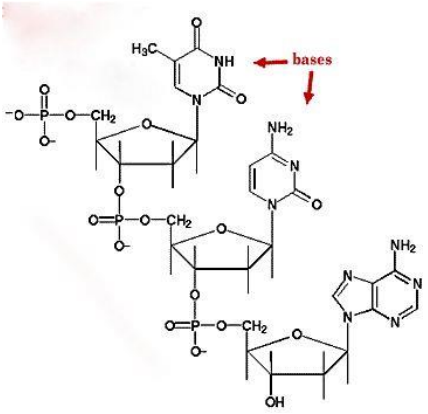
4. If one strand of DNA is C-C-T-A-G-G-A-T what is the base sequence of the complimentary strand of DNA?
    a. G-G-U-T-C-C-T-U
    b. G-G-A-T-C-C-T-A
    c. G-G-A-U-C-C-U-A
    d. T-T-A-T-C-C-T-A

5. What is meant by the statement, "the two strands of DNA are anti-parallel to each other"?
    a. Each strand of a DNA molecule has its own genetic code
    b. The strands are not parallel to each other they are perpendicular.
    c. There is a direction to each strand of DNA and they run opposite to each other.
    d. The strands of DNA may be split apart and flipped in order to produce RNA.

6. What is the template strand of a DNA molecule?
    a. This is the new strand of DNA, produced from the older strand.
    b. This is the parent strand from which the new strand is produced.
    c. This is the parent strand, which is protected and never used.
    d. This is the strand that will leave the nucleus and take the genetic message to the rest of the cell.

The illustration below shows a section of a single strand of a DNA molecule. Using this illustration, answer questions 7 and 8.

a.



b

http://faculty.rhodes.edu/lindquester/molbiol/dnastructure.html

7. One end of the DNA strand is labeled "a". Which end of the DNA strand is this?
    a. this is the 3' end of the strand.
    b. this is the 5' end of the strand
    c. we cannot determine because we need the complementary strand
    d. this is the promoter end

8. Another nucleotide is to be added to this strand. To which end of the DNA molecule will this nucleotide be added?
    a. to the end of the "a" strand
    b. to the base at the top
    c. to the "b" end
    d. not enough information

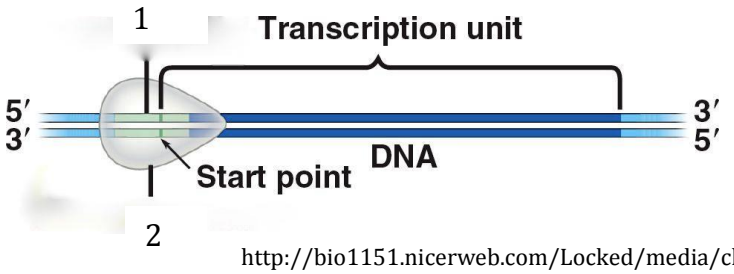
9. There is an enzyme that catalyzes the reaction, adding a nucleotide to a growing strand of DNA. Which enzyme is this?
    a. DNA helicase
    b. RNA helicase
    c. RNA polymerase
    d. DNA polymerase

10. DNA replicates in a way that is called "semi-conservative". Why is this replication considered "semi-conservative"
    a. Each copy contains one strand from the original DNA molecule.
    b. During replication, RNA is produced that conserves the code.
    c. The one new DNA strand is entirely new and the parent strand is entirely the original.
    d. The method of replication uses enzymes therefore it is conserving energy.

11. Once the RNA is produced, what is its function?
    a. to bring sugar for metabolism out of the nucleus
    b. to bring the genetic code to be released from the cell
    c. to bring the genetic code out of the nucleus
    d. to bring the bases to the mitochondria

12. The sequence of bases in RNA
    a. are seldom critical as DNA contains the actual "code".
    b. are critical to the production of complex molecules
    c. are seldom used other than to connect to the cell membrane
    d. are critical to the production of DNA from the RNA strand

The illustration below shows the initiation of transcription. Use this illustration and the information provided to answer questions 13 and 14.



http://bio1151.nicerweb.com/Locked/media/ch17/initiation.html

13. In the illustration, the number 1 is the label for a section of the DNA just before the start point of transcription. What is this section of the DNA?
    a. initiation point
    b. starting bases
    c. promotor region
    d. initiation region

14. In the illustration, the number 2 is the label for an object that attaches to the DNA and that will build another molecule from the DNA strand. Which of the descriptions below best identifies this object?
    a. This is an enzyme called RNA polymerase.
    b. This is an enzyme called DNA polymerase.
    c. This is a lipid called DNA polymerizer.
    d. This is a protein called RNA polymerizer.

15. DNA consists of two strands, one that is utilized to produce the RNA. Which strand of DNA is directly used to produce the RNA?
    a. non-template strand
    b. gene strand
    c. template strand
    d. non-gene strand

16. RNA itself is produced starting at the 5' end. If the DNA <u>non-template</u> strand sequence is 5' T-A-T-C-C-G-A-A-T-C-G 3' what will be the sequence of the mRNA produced?
    a. 5' A-U-A-G-G-C-U-U-A-G-C 3'
    b. 3' A-U-A-G-G-C-U-U-A-G-C 5'
    c. 5' A-T-A-G-G-C-T-T-A-G-C 3'
    d. 5' U-A-U-C-C-G-A-A-U-C-G 3'

17. How does the process of transcription stop?
    a. The DNA polymerase reaches a termination code on the RNA
    b. The RNA polymerase reaches a termination code on the DNA
    c. The end point is variable so that the RNA contains codes for any number of genes.
    d. The stop codon within the RNA polymerase triggers the end.

18. The structure of proteins is directly related to their ability to perform their function(s) within the cell. Which of the following factors are critical to protein structure?
    a. sequence of amino acids
    b. three dimensional shape
    c. where in the cell the protein is produced
    d. both a and b

19. The process of using the information on mRNA to produce a protein is called
    a. replication
    b. transcription
    c. translation
    d. transduction

20. The mRNA base sequence is considered a code. Three bases are read at a time. What is this three base code called and what does it code for?
    a. tri-code, DNA
    b. base coding, more RNA
    c. coding code, amino acids
    d. codon, amino acids

21. There are 64 of these three letter codes. There are only 20 different amino acids. What do the remaining 44 codes code for?
    a. Amino acids have more than one code and some are also start and stop codes.
    b. The other 44 codes are nonsense and don't code for any amino acids.
    c. The other 44 codes are mutations so code for the wrong amino acid.
    d. Amino acids have two codes each.

22. Which of the following statements **best** describes why the genetic code is considered to be "universal".
    a. All organisms except bacteria and viruses utilize the same genetic code.
    b. All organisms including bacteria and viruses utilize the same genetic code.
    c. All organisms utilize the same nitrogenous bases, but may code for different amino acids.
    d. All animals utilize one code while all plants utilize a different code.

The chart below shows the mRNA codes for amino acids. Use this chart to answer questions 23 and 24.

First Letter	Second Letter				Third Letter
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	(start) methionine	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	C
	valine	alanine	glutamate	glycine	A
	valine	alanine	glutamate	glycine	G

http://www.oconee.k12.sc.us/webpages/tstanton/index.cfm?subpage=47164

23. A portion of an mRNA sequence to be "de-coded" is **CAAGUGUAC.** What will the amino acid sequence be for this section of mRNA?
    a. glutamine, leucine, stop
    b. glutamine, valine, tyrosine
    c. valine, histidine, methionine
    d. glutamic acid, leucine, tyrosine

24. It is determined that a protein contains the amino acid sequence of phenylalanine, serine, aspartate. Which of the following mRNA base sequences **could** code for this amino acid sequence?
    a. UUCAGAGAU
    b. UUUAGCGAG
    c. UUUAGCGAC
    d. UUAAGCGAA

It is possible to determine the amino acid sequence using a slightly different chart. Below is one of these charts. Using all of the information included, respond to question 25 and 26 below.

	T	C	A	G	
T	Phe	Ser	Tyr	Cys	T
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	*	*	A
	Leu	Ser	*	Trp	G
C	Leu	Pro	His	Arg	T
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	T
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	T
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

http://www.geneinfinity.org

25. Which of the following will be the amino acid sequence from the DNA template sequence of GAGCCCTAT ?
    a. Leu,Pro,Ile
    b. Glu, Gly,Phe
    c. Leu,Gly,Tyr
    d. Glu,Pro,Tyr

26. How can we immediately identify whether we are using an mRNA chart or a DNA chart of codes for amino acids?
    a. We must read the title to determine this.
    b. There are entirely different amino acids listed.
    c. A DNA chart has T while an mRNA chart has U.
    d. An mRNA chart has T while a DNA charts has U.

27. The central dogma of biology refers to which of the following?
    a. The concept that RNA leads to DNA, which leads to proteins through transcription and translation.
    b. The concept that translation is the most important step in the process of producing proteins from DNA and RNA
    c. The concept that proteins carry the same genetic code that originates in the DNA.
    d. The concept that DNA, via transcription, results in RNA, which, via translation, results in proteins.

28. The central dogma is a one-way process. Which of the following **best** describes what is meant by this statement?
    a. Changes in proteins may affect either RNA or DNA, but change in DNA or RNA will not affect proteins.
    b. Changes in RNA may affect either proteins or DNA, but changes in DNA or proteins will not affect RNA.
    c. Changes in DNA or RNA will affect proteins, but changes in proteins or RNA will not affect DNA.
    d. Any changes in DNA will stop the processes of transcription and translation.

29. In any type of translation we are converting something from one language to another. How can we describe this change in "languages"?
    a. The language of nucleotides is being changed into the language of amino acids.
    b. The language of amino acids is being changed into the language of nucleotides.
    c. The language of base codes is being changed in the language of nucleotides.
    d. The language of nucleotides is being changed into the language of bases.

30. What is the primary role of the ribosome?
    a. It contains two subunits; a small and a large.
    b. It catalyzes the bonds of amino acids to make a protein.
    c. It has a P and an A site.
    d. It carries the amino acid to the ribosome.

31. What is the primary role of the tRNA?
    a. It carries the protein away from the ribosome.
    b. It carries the mRNA to the ribosome.
    c. It brings an amino acid to the ribosome.
    d. It contains a codon for each amino acid.

32. What is the "A" site?
    a. A site on the mRNA that initiates translation.
    b. A site on the tRNA that initiates translation.
    c. A site within the ribosome where amino acids are delivered.
    d. A site within the ribosome where the new protein is emerging.

33. The "codes" between the mRNA and tRNA are said to be complimentary. What is meant by this?
    a. The bases on the mRNA match up with the bases on tRNA, A with U and C with G.
    b. The bases on the mRNA match up with the bases on the tRNA, A with A, U with U, C with C, and G with G.
    c. The bases on the mRNA match up with the bases on the tRNA, A with T, and C with G.
    d. The bases on the mRNA match up with the bases on the tRNA, A with A, T with T, C with C and G with G.

34. To code for a particular protein, a gene consists of 7356 base pairs. Assuming that 3 base pairs code for the START and 3 base pairs code for STOP, approximately how many amino acids do we anticipate exist within the protein?
    a. 2452 amino acids
    b. 22,068 amino acids
    c. 2451 amino acids
    d. 22,050 amino acids

35. The ribosome catalyzes a bond between the amino acids in order to build the protein. What type of bonds are these?
    a. Covalent hydrogen bonds
    b. Covalent peptide bonds
    c. Ionic hydrogen bonds
    d. Ionic carbon bonds

36. What is involved in the process of "gene expression"?
    a. Using the code found in a protein to produce more of the same protein.
    b. Producing a mRNA base sequence from the protein needed by the cell.
    c. Producing a tRNA anticodon from the protein needed by the cell.
    d. Using the code from DNA to ultimately produce a protein.

37. Transcription and translation both occur in three (3) steps. What do we call these steps?
    a. Initiation, termination, release
    b. Elongation, initiation, termination
    c. Initiation, elongation, termination
    d. DNA, mRNA, tRNA

38. What action occurs between the amino acids as they are held in the P site and A site within the ribosome?
    a. They are split apart to be used again in another protein sequence.
    b. They are bonded together to elongate the protein produced.
    c. They are bonded together to become part of the mRNA code.
    d. They are split apart to destroy unneeded proteins.

39. The normal CFTR protein is a chloride channel protein found in membranes of cells that line passageways of the lungs, liver, pancreas, intestines, reproductive tract, and skin. A mutation in the gene for this protein results in cystic fibrosis. This protein consists of 1480 amino acids. Approximately how many base pairs code for this protein?
    a. 493 bp
    b. 740 bp
    c. 4440 bp
    d. 2960 bp

40. The average human gene consists of 3000 base pairs. Therefore the average protein consists of approximately _____ amino acids.
    a. 9000
    b. 1000
    c. 1500
    d. 4500

Answer Key

Question #	Correct response		Question #	correct response
1	D		21	A
2	A		22	B
3	C		23	B
4	B		24	C
5	C		25	D
6	B		26	C
7	B		27	D
8	C		28	C
9	D		29	A
10	A		30	B
11	C		31	C
12	B		32	C
13	C		33	A
14	B		34	B
15	C		35	B
16	D		36	B
17	B		37	C
18	D		38	B
19	C		39	C
20	D		40	B