Mr. Stone
Biology I

Name:_____

Chapter 8 Celebration of Knowledge

1. Which scientist(s) produced X-ray crystallography that showed DNA was a double helix?
a. Hershey and Chase
b. Watson and Crick
c. Rosalind Franklin
d. Avery

2. What bonds nucleotides together in a strand of RNA?
a. hydrogen bonds between the nitrogen bases
b. covalent bonds between the nitrogen bases
c. hydrogen bonds between the two phosphates
d. covalent bonds between the phosphate of one nucleotide and the sugar of another nucleotide.

3. In which of the following can you find the nucleotides adenine, cytosine, guanine, and thymine? (you may circle more than one choice)
a. Viruses
b. R bacteria
c. S bacteria
d. Humans
e. all of the above

4. The DNA molecule is made up of how many strands?
a. 1
b. 2
c. 3
d. 6
e.12

5. Messenger RNA differs from other types of RNA because it
a. transfers genetic instructions from cell nucleus to cytoplasm.
b. makes up part of a ribosome.
c. carries an amino acid at one end.
d. contains anticodons.

6. Adenine will hydrogen bond with
a. thymine
b. guanine
c. uracil
d. cytosine
e. both a and c

7. The lac operon is an example of
a. mutagens in the environment
b. gene control in prokaryotes
c. gene control in eukaryotes
d. lactose intolerance in E. coli bacteria.

8. Transcription
a. occurs on the surface of the ribosome.
b. is the final process in the assembly of a protein.
c. occurs during the synthesis of any type of RNA from a DNA template.
d. is catalyzed by DNA polymerase.
e. all of the above

9. The portion of the mRNA molecule that is NOT translated is composed of
a. introns.
b. exons.
c. transcriptons
d. anticodons.

10. In transcription
a. several amino acids are assembled by the messenger RNA molecules at one time.
b. a special sequence called a promoter is necessary for transcription to begin.
c. certain polypeptide sequences are governed by one ribosome, while other sequences are produced by other ribosomes.
d. the transfer RNA molecules arrange the messenger RNA codons into the appropriate sequence.
e. none of the above

11. If a codon consisted of two nucleotides instead of three, how many different types of amino acids could be combined to form proteins?
a. 2
b. 4
c. 16
d. 32
e. none of the above

12. If thymine makes up 22% of the nucleotides in a sample of DNA from an organism, then cytosine would make up what percent of the bases?
a. 22
b. 44
c. 28
d. 56

13. Four of the five elements listed below are components of a nucleotide. Select the exception.
a. carbon
b. oxygen
c. nitrogen
d. sulfur
e. phosphorous

14. A virus is made of
a. proteins and nucleic acid
b. carbohydrates and nucleic acid
c. proteins and carbohydrates
d. nucleic acids and exothermic enzymes

15. In a cell, the transfer of genetic information from RNA to protein occurs in the _____ and is called _____.
a. nucleus, translation
b. nucleus, transcription
c. ribosome, translation
d. ribosome, transcription

16. If a bacterial protein has 40 amino acids, how many nucleotides are needed to code for it?
a. 30
b. 60
c. 90
d. 120

17. What enzyme is responsible for the replication of DNA?
a. ribosome transcriptase
b. DNA polymerase
c. RNA polymerase
d. DNA transcriptase
e. DNA transcription enzyme

18. The specific protein produced in a cell is due to the
a. amino acid sequence in the DNA molecule
b. sugar and phosphate sequence in the DNA molecule
c. number of ribosomes in the cell
d. number of mitochondria in the cell
e. the nucleotide sequence in the DNA molecule

19. The amino acid that corresponds to the START codon is
a. lysine
b. methionine
c. cysteine
d. glycine
e. phenylalanine

20. What enzyme proofreads the DNA strands during replication?
a. helicase
b. nuclease
c. ligase
d. DNA polymerase
e. primase

21. A frameshift mutation could not result from
a. base insertion
b. base deletion
c. deletion of two consecutive bases
d. deletion of three consecutive bases

22. If the triplet CCC codes for the amino acid proline in bacteria, than in plants CCC should code for
a. leucine
b. valine
c. cystine
d. phenylalanine
e. proline

23. Describe the three main ways in which RNA differs from DNA. (3 points)

RNA is single stranded, has Uracil instead of Thymine, and contains ribose sugar instead of deoxyribose.

24. Describe the processing of an mRNA transcript before it leaves the nucleus. (3 points)

Introns are removed and exons are spliced back together. The 5' end of the mRNA receives a methyl-G cap and a poly-A tail is added to the 3' end.

25. DNA is replicated before both mitosis and meiosis. How does the amount of DNA produced in a cell during mitosis compare with that produced during meiosis? (2 points)

After meiosis a cell only has half as much DNA as a cell after mitosis.

26. Complete the table below (8 points). Use the codon chart to identify the correct amino acid.

DNA Template	mRNA Codon	tRNA Anticodon	Amino Acid
TAC	AUG	UAC	met
GTA	CAU	GUA	his
ACT	UGA	none	STOP

	U		C		A		G		
U	UUU	Phe	UCU	Ser	UAU	Tyr	UGU	Cys	U
	UUC		UCC		UAC		UGC		C
	UUA	Leu	UCA		UAA	Stop	UGA	Stop	A
	UUG		UCG		UAG	Stop	UGG	Trp	G
C	CUU	Leu	CCU	Pro	CAU	His	CGU	Arg	U
	CUC		CCC		CAC		CGC		C
	CUA		CCA		CAA	Gln	CGA		A
	CUG		CCG		CAG		CGG		G
A	AUU	Ile	ACU	Thr	AAU	Asn	AGU	Ser	U
	AUC		ACC		AAC		AGC		C
	AUA		ACA		AAA	Lys	AGA	Arg	A
	AUG	Met	ACG		AAG		AGG		G
G	GUU	Val	GCU	Ala	GAU	Asp	GGU	Gly	U
	GUC		GCC		GAC		GGC		C
	GUA		GCA		GAA	Glu	GGA		A
	GUG		GCG		GAG		GGG		G

26. Suppose a bacterium had a mutated repressor protein that could not bind to the *lac* operator. How might this affect regulation of the operon? (4 points)

If the repressor cannot bind to the operator, then transcription would occur whether or not lactose in present in the cell (known as a constitutive mutation).

27. For the Hershey-Chase experiment, explain why the experimental result justified the conclusion that DNA is the genetic material, and not protein. (4 points)

DNA contains phosphorus but no sulfur, whereas protein can contain sulfur but not phosphorus. After the bacteriophages infected the bacteria with their hereditary molecule, radioactive phosphorus was found in the cells, but not radioactive sulfur.

30. Explain why frameshift mutations have a greater effect than point mutations. (4 points)

A frameshift mutation, like an insertion or deletion, not only changes a codon, but also every codon in the mRNA. A point mutation only changes a single codon.

BONUS (5 points): Biologists have recently succeeded at genetically engineering *E. coli* bacteria in a new way. These cells have to be fed a new, man-made amino acid to survive. How did biologists take advantage of a STOP codon to genetically engineer these *E. coli* cells?

The biologists made a tRNA that matches the stop codon with its anti-codon, so instead of being a STOP codon the codon now specifies the synthetic (man-made) amino acid. This was a useful invention because now these transgenic bacteria cannot survive outside of laboratory conditions.