

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, than adenine 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
- proteins and nucleic acid
 - carbohydrates and nucleic acid
 - proteins and carbohydrates
 - nucleic acids and exothermic enzymes
15. In a cell, the transfer of genetic information from RNA to protein occurs in the _____ and is called _____.
- nucleus, translation
 - nucleus, transcription
 - ribosome, translation
 - ribosome, transcription
16. If a bacterial protein has 40 amino acids, how many nucleotides are needed to code for it?
- 30
 - 60
 - 90
 - 120
17. What enzyme is responsible for the replication of DNA?
- ribosome transcriptase
 - DNA polymerase
 - RNA polymerase
 - DNA transcriptase
 - DNA transcription enzyme
18. The specific protein produced in a cell is due to the
- amino acid sequence in the DNA molecule
 - sugar and phosphate sequence in the DNA molecule
 - number of ribosomes in the cell
 - number of mitochondria in the cell
 - the nucleotide sequence in the DNA molecule
19. The amino acid that corresponds to the START codon is
- lysine
 - methionine
 - cysteine
 - glycine
 - phenylalanine
20. What enzyme proofreads the DNA strands during replication?
- helicase
 - nuclease
 - ligase
 - DNA polymerase
 - primase
21. A frameshift mutation could not result from
- base insertion
 - base deletion
 - deletion of two consecutive bases
 - 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
- leucine
 - valine
 - cystine
 - phenylalanine
 - proline
23. Describe the three main ways in which RNA differs from DNA. (3 points)
24. Describe the processing of an mRNA transcript before it leaves the nucleus. (3 points)
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)

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

DNA Triplet	mRNA Codon	tRNA Anticodon	Amino Acid
	AUG	UAC	
		GUA	
ACT			

	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	U
	CUC	CCC	CAC	CGC Arg	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)

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)

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

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?

