Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Class: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

DNA + Gene Expression + Gene Regulation

Independent Questions 9-20

9. For a science fair project, two students decided to repeat the Hershey and Chase experiment, with modifications. They decided to label the nitrogen of the DNA, rather than the phosphate. They reasoned that each nucleotide has only one phosphate and two to five nitrogens. Thus, labeling the nitrogens would provide a stronger signal than labeling the phosphates. Why won't this experiment work?

A) There is no radioactive isotope of nitrogen.

B) Radioactive nitrogen has a half-life of 100,000 years, and the material would be too dangerous for too long.

C) Although there are more nitrogens in a nucleotide, labeled phosphates actually have sixteen extra neutrons; therefore, they are more radioactive.

D) Amino acids (and thus proteins) also have nitrogen atoms; thus, the radioactivity would not distinguish between DNA and proteins.

Bloom's Taxonomy: Application/Analysis

Section: 16.1

10. Suppose you are provided with an actively dividing culture of *E. coli* bacteria to which radioactive thymine has been added. What would happen if a cell replicates once in the presence of this radioactive base?

A) One of the daughter cells, but not the other, would have radioactive DNA.

B) Neither of the two daughter cells would be radioactive.

C) All four bases of the DNA would be radioactive.

D) DNA in both daughter cells would be radioactive.

Bloom's Taxonomy: Application/Analysis

Section: 16.2

11. At a specific area of a chromosome, the sequence of nucleotides below is present where the chain opens to form a replication fork: ** C C T A G G C T G C A A T C C **

An RNA primer is formed starting at the underlined T (T) of the template. Which of the following represents the primer sequence?

A)  G C C T A G G 

B)  A C G T T A G G 

C)  A C G U U A G G 

D)  G C C U A G G 

Bloom's Taxonomy: Synthesis/Evaluation

Section: 16.2

12. You briefly expose bacteria undergoing DNA replication to radioactively labeled nucleotides. When you centrifuge the DNA isolated from the bacteria, the DNA separates into two classes. One class of labeled DNA includes very large molecules (thousands or even millions of nucleotides long), and the other includes short stretches of DNA (several hundred to a few thousand nucleotides in length). These two classes of DNA probably represent \_\_\_\_\_.

A) leading strands and Okazaki fragments

B) lagging strands and Okazaki fragments

C) Okazaki fragments and RNA primers

D) leading strands and RNA primers

Bloom's Taxonomy: Application/Analysis

Section: 16.2

13. The genetic code is essentially the same for all organisms. From this, one can logically assume which of the following?

A) A gene from an organism can theoretically be expressed by any other organism.

B) DNA was the first genetic material.

C) The same codons in different organisms translate into different amino acids.

D) Different organisms have different types of amino acids.

Bloom's Taxonomy: Synthesis/Evaluation

Section: 17.1

14. Which of the following statements best describes the termination of transcription in prokaryotes?

A) RNA polymerase transcribes through the polyadenylation signal, causing proteins to associate with the transcript and cut it free from the polymerase.

B) RNA polymerase transcribes through the terminator sequence, causing the polymerase to separate from the DNA and release the transcript.

C) Once transcription has initiated, RNA polymerase transcribes until it reaches the end of the chromosome.

D) RNA polymerase transcribes through a stop codon, causing the polymerase to stop advancing through the gene and release the mRNA.

Bloom's Taxonomy: Knowledge/Comprehension

Section: 17.2

15. Use this model of a eukaryotic transcript to answer the following question(s).

E = exon and I = intron ** UTR E1 I1 E2 I2 E3 I3 E4 UTR **

Which components of the previous molecule will also be found in mRNA in the cytosol?

A)  UTR I1 I2 I3 UTR 

B)  E1 E2 E3 E4 

C)  UTR E1 E2 E3 E4 UTR 

D)  E1 I1 E2 I2 E3 I3 E4 

Bloom's Taxonomy: Application/Analysis

Section: 17.3

16. Put the following events of elongation in prokaryotic translation in chronological order.

1. Binding of mRNA with small ribosomal subunit

2. Recognition of initiation codon

3. Complementary base pairing between initiator codon and anticodon of initiator tRNA

4. Base pairing of the mRNA codon following the initiator codon with its complementary tRNA

5. Attachment of the large subunit

A) 1, 2, 3, 4, 5

B) 2, 1, 4, 3, 5

C) 5, 4, 3, 2, 1

D) 1, 2, 3, 5, 4

Bloom's Taxonomy: Application/Analysis

Section: 17.4

*Suppose an experimenter becomes proficient with a technique that allows her to move DNA sequences within a prokaryotic genome.*

17. If she moves the promoter for the *lac* operon to the region between the beta galactosidase (*lacZ*) gene and the permease (*lacY*) gene, which of the following would be likely?

A) The three structural genes will be expressed normally.

B) RNA polymerase will no longer transcribe permease.

C) The operon will still transcribe the *lacZ* and *lacY* genes, but the mRNA will not be translated.

D) Beta galactosidase will not be produced.

Bloom's Taxonomy: Application/Analysis

Section: 18.1

18. If she moves the repressor gene (*lacI)*, along with its promoter, to a position at some several thousand base pairs away from its normal position, we would expect the \_\_\_\_\_.

A) repressor will no longer bind to the operator

B) repressor will no longer bind to the inducer

C) *lac* operon will be expressed continuously

D) *lac* operon will function normally

Bloom's Taxonomy: Application/Analysis

Section: 18.1

19. At the beginning of this century there was a general announcement regarding the sequencing of the human genome and the genomes of many other multicellular eukaryotes. Many people were surprised that the number of protein-coding sequences was much smaller than they had expected. Which of the following could account for much of the DNA that is not coding for proteins?

A) DNA that consists of histone coding sequences

B) DNA that is translated directly without being transcribed

C) non-protein-coding DNA that is transcribed into several kinds of small RNAs with biological function

D) non-protein-coding DNA that serves as binding sites for reverse transcriptase

Bloom's Taxonomy: Application/Analysis

Section: 18.3

20. A cell is considered to be differentiated when it \_\_\_\_\_.

A) replicates by the process of mitosis

B) loses connections to the surrounding cells

C) produces proteins specific to a particular cell type

D) appears to be different from the surrounding cells

Bloom's Taxonomy: Application/Analysis

Section: 18.4