Central Dogma Worksheet (Boomer's Second 3 Lectures)

Sample Multiple Choice

1. Which of the following does not participate in REPLICATION?

a. DNA Polymerase
b. RNA Polymerase
c. Helicase
d. Telomerase
e. Primase

2. In the lac operon, lactose acts to

a. place the repressor on the operator
b. place the RNA Polymerase on the operator
c. remove the repressor from the operator
d. remove the RNA Polymerase from the operator
e. turn off expression of the lac operon genes

3. Mutations

a. occur during transcription
b. occur during mitosis
c. occur during S phase
d. always produce an altered protein
e. are all caused by exposure to harmful chemicals

4. The following table is a good way to study the central dogma (although the boxes are FAR too small). All categories may not be applicable to each step but you should be able to figure out some reasonable answers for each. The enzyme/function list is VERY important and will be fairly involved.

	Replication	Transcription	Translation
Overall function, purpose, summary reaction			
List of all enzymes/cell machinery with function for each			
Specific events/signals used to begin process			
Specific events/signals used to end process			

5. Contrast leading vs. lagging strands; be able to recognize on an unlabeled replication bubble diagram.

6. Contrast eukaryotic vs. prokaryotic replication.

7. Define and contrast base-pairing accidents and DNA damage (including statistics) - and discuss mechanisms and specific enzymes used by the cell for dealing with each.

8. Discuss the "end problem" - including how cells deal with it, and relevant applications. Beyond the lecture: Do prokaryotes deal with the end problem? What does this say about their "mortality?"

9. What the fate and/or function of each of the following are: mRNA, tRNA, rRNA .

10. Fully understand the anatomy of a gene in terms of what is required for transcription AND translation; contrast eukaryotic with prokaryotic genes (HINT: prokaryotes use operons).

11. Fully understand the genetic code - what it is, its attributes, and how to use the codon table.

12. How are the enzymes that polymerize DNA and RNA alike? How are the enzymes they different?

13. How are some RNA molecules like proteins? Give one example.

14. The following table is a good way to organize, compare, and study DNA history. Although all categories may not be applicable, you should be able to figure reasonable answers out for each.

	Scientist	Experiment(s)	Key Data	Organism Used	Relates to?
Transformation					
DNA Composition - %ATCG					
DNA X-Ray Crystallography					
DNA Structure - Double Helix					

15. Draw a simple REPLICATION FORK that incorporates the following elements or terms: lagging strand, leading strand, Okasaki fragments (show 2), Helicase location, all 5' and 3' ends

17. Transcribe the following gene.

```
5'-CCCTATATPROMOTERCGCGATGAAAGGGCCCTGAGGGTERMINATORAAAAA-3'
3'-GGGATATAPROMOTERGCGCTACTTTCCCGGGACTCCCTERMINATORTTTTT-5'
```

18. Translate the following mRNA. (typically graded ALL OR NOTHING!)

5'-CGAUGCCCGGGAAUUAAGGGAAAAA -3'

19. Using lecture problem example for practicing codon/anticodon/amino acid relationships, come up with YOUR OWN new table problems for self-study. Here is the lecture problem again.

Amino acid				Gln
tRNA		UUU	GAU	
mRNA	ACU			

20. Fully understand the anatomy of a ribosome; outline key events during translation initiation, elongation, and termination.

21. Be able to define ALL kinds of mutations described in lecture.

22. Using lecture problem for practicing different kinds of substitutions, come up with YOUR OWN new table problems for self-study. Remember: you need to propose a SINGLE change that creates each kind of substitution for each codon.

Codon	e.g. UUA	Your ideas	Your ideas	Your ideas
Silent				
Missense				
Nonsense				

23. The following table is a good way to organize, compare, and study gene regulation. Begin by fully mastering any unfamiliar vocabulary

Lactose	Repressor Status	Operator Status	RNA Pol Status	Lac enzyme Status
+				
-				