

Biology 150: 4th in-class examination
April 25, 2014

Name _____

Indicate the lab you are registered in:

Monday, 1-2:50 _____ ; Tuesday, 10-11:50 _____; Tuesday, 1-2:50 _____ ; Tuesday, 3-4:50 _____

Answer the questions in the space provided and you may also use the back of the page to complete your response. There are 15 questions worth a total of 50 points (plus four bonus questions). The point value of individual questions appears in parentheses.

Note: a copy of the genetic code is printed on the last page.

1. In the the initial reaction of the Calvin cycle, a large enzyme named _____ combines CO₂ with _____ to yield an unstable six carbon compound that spontaneous forms two molecules of PGA. Next, PGA is phosphorylated and reduced by ATP and NADPH to yield _____ which can leave the chloroplast as glucose or be reassembled into _____ following a complex series of reactions requiring more ATP. (4)
2. In 1944 Avery, Macleod, and McCarty found that bacterial transformation required _____ but did not require _____. (2)
3. The role of DNA in heredity was demonstrated most unambiguously by Martha Chase and Alfred Hershey in 1952. Briefly describe their experiment(s). (4)

4. The double helix model for the structure of DNA first suggested by Watson and Crick depended on data collected by two other scientists Erwin Chargaff and Rosalind Franklin. Describe the data each collected and how it was accounted for in the double helix model. (3)
5. DNA replication in eukaryotes begins when regulatory molecules (i.e. DNA binding proteins) bind at several points along each chromosome called _____. Binding of these DNA binding proteins allows an enzyme that separates the strands called _____ to bind. Tension produced by separating the strands is relieved by the enzyme _____. Separated strands are stabilized and kept apart by _____. The new daughter strands produced by replication are designated by different names. The strand formed following the separating strands is called the _____ strand. The strand formed in a "backstitch" pattern, bit by bit, away from the separating strands is called the _____ strand. Actual DNA synthesis can only occur after an enzyme called _____ first synthesizes 10 base RNA segments called a _____. The blunt ends of these RNA segments allows an enzyme complex called _____ to bind and synthesize DNA always travelling in the _____ direction along the template strand of the DNA. The new DNA of the "backstitched" strand is synthesized as 1000-2000 base stretches called _____. Later an enzyme called _____ replaces the short stretches of RNA with DNA and an enzyme called _____ connects the sections of DNA together. (13)
6. Assume that the following, running 3' to 5', is the DNA (gene) sequence at the beginning of the coding sequence for a specific mRNA. Give (a) the sequence of the product of transcription and (b) the order of the first five amino acids in the resulting polypeptide.(3)

TACCCGTTACGAGTACAAGGATTGAACAGTCACTGG

7. Processing of mRNA before it passes from the eukaryote nucleus into the cytosol involves cutting out and discarding portions called _____. The portions retained are called _____. In addition, the 5' end of the molecule is modified by _____ and the 3' end is modified by _____ (4)
8. Distinguish between a point mutation and a frameshift mutation. (1)
9. Distinguish between a missense mutation and a nonsense mutation. (1)
10. Define codon. (1)
11. Describe and/or diagram the events of translation. In what order do the components come together? How is protein amino acid sequence determined? How is translation terminated? (5)
12. Some proteins end up in the endoplasmic reticulum. Describe how they get there? (4)

13. Describe and/or diagram the lac operon. Name and indicate the relative location of the different elements. Describe how changing lactose concentration alters function. (4)

14. How do inducible and repressible operons differ? (1)

Bonus questions:

(1) What do the following abbreviations stand for? (4)

- a) PGAL
- b) Rubisco
- c) RuBp
- d) PGA

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