This exam consists of two parts. Part I is multiple choice. Each of these 25 questions is worth two points. Answer the Part I questions on this sheet, below. Answer the Part II questions on the question pages.

Please use BLOCK CAPITAL letters like this --- A, B, C, D, E. Not lowercase!

1. _____  10. _____  18. _____
2. _____  11. _____  19. _____
3. _____  12. _____  20. _____
4. _____  13. _____  21. _____
5. _____  14. _____  22. _____
6. _____  15. _____  23. _____
7. _____  16. _____  24. _____
8. _____  17. _____  25. _____
9. _____

GRADE:

Part I Total    _____

Part II:

II-1    _____
II-2    _____
II-3    _____
II-4    _____
II-5    _____

Part II Total    _____

Total, I & II    _____
1. Glycogen Synthase lengthens the chain of glycogen by reacting with
   A. Glucose-1-P   D. UDP-Glucose
   B. Glucose-2-P   E. UDP-Galactose
   C. Glucose-6-P

2. How much liver glycogen would an average person have?
   A. 2.8 Calories   D. 2800 Cal
   B. 28 Cal   E. 28,000 Cal
   C. 280 Cal

3. The "remodeling" of glycogen during breakdown does not involve
   A. branching enzyme   D. transferase
   B. debranching enzyme   E. any of the above
   C. α 1-6 glycosidase

4. Complete breakdown of stearyl CoA (18:0) would yield how many high energy phosphate bonds ("ATP")?
   A. 106   D. 122
   B. 108   E. none
   C. 116

5. Which condition could not lead to "ketosis"?
   A. starvation   D. eating a bag of potato chips
   B. diabetes   E. going on the Atkins diet
   C. running the last mile of a marathon

6. ACP stands for
   A. almost completely puzzled
   B. automatic chloride pump
   C. acyl carrier protein
   D. amino-cysteinyl peptide

7. The function of Carnitine is
   A. redox cofactor   D. transport fatty acids
   B. one carbon carrier   E. cleave chymotrypsinogen
   C. help digest meat

8. Ubiquitin is
   A. another name for Coenzyme Q
   B. an enzyme that breaks down proteins
   C. a small protein marker for protein turnover
   D. a folding chaperone

9. High levels of GOT, or Aspartate Aminotransferase in the blood serum, indicates:
   A. brain damage   D. heart or liver damage
   B. torn tendons   E. PKU
   C. viral infection
10. Norepinephrine is converted into Epinephrine with the aid of
   A. SAM  
   B. TPP  
   C. THF  
   D. PLP

11.* The compound shown below is
   A. N5 methyl THF  
   B. N5 formyl THF  
   C. N5 N10 methylene THF  
   D. N5 N10 methenyl THF  
   E. N10 formyl THF

12. Gout and Lesch Nyhan Syndrome are both due to unusually high levels of what?
   A. uric acid  
   B. urea  
   C. uronate  
   D. niacin  
   E. heme groups

13. Methotrexate works in chemotherapy because it
   A. prevents fatty acid metabolism  
   B. prevents DNA synthesis  
   C. damages RNA

14. Restriction cleavage sites are "palindromic" -- which sequence below could be a restriction site for some enzyme?
   A. GCACGCAC  
   B. GCACCACG  
   C. GCACGTGC  
   D. GCACACGC  
   E. none of the above

15. Taq DNA Pol is used in PCR because
   A. it is inexpensive  
   B. it is not processive  
   C. it doesn't require a primer  
   D. it works at high temperatures  
   E. none of the above

16. pBR322, a plasmid frequently used as a vector, has resistance genes for
   A. cipro and nalidixic acid  
   B. ampicillin and tetracycline  
   C. streptomycin and erythromycin  
   D. aspirin and amanitin  
   E. cocaine and alcohol

17. An Okazaki fragment has which structure?
   A. short DNA strand  
   B. DNA at 5' end, RNA at 3'  
   C. RNA at 3' end, DNA at 5'  
   D. short RNA strand  
   E. none of the above

18. A supercoiled plasmid is found to have 27 right handed coils (or "twists") and 3 left handed supercoils ("writhes"). The linking number is
   A. –31.5  
   B. –27  
   C. +24  
   D. +27  
   E. +30  
   F. +31.5
19. Which polymerase adds 1000 nucleotides per second and is highly processive?
A. RNA Pol  
B. DNA Pol I  
C. DNA Pol II  
D. DNA Pol III  
E. Peptidyl Synthase in the ribosome

20. Which drug specifically inhibits initiation of prokaryotic transcription?
A. actinomycin  
B. α-amanitin  
C. ciprofloxacin  
D. rifampicin  
E. streptomycin

21. One kind of RNA is neither processed nor modified – which?
A. eucaryotic mRNA  
B. procaryotic mRNA  
C. eucaryotic tRNA  
D. procaryotic tRNA  
E. eucaryotic rRNA  
F. procaryotic rRNA

22. How many different aminoacyl tRNA synthetase enzymes are present in E. coli?
A. 64  
B. 52  
C. 36  
D. 20  
E. 11

23. The "Shine and Dalgarno" interaction involves the 5' end of mRNA and
A. the 3' end of the 23S rRNA  
B. the 5' end of the 5S rRNA  
C. the 3' end of the 16S rRNA  
D. the 3' end of a tRNA  
E. none of the above

24. Which drug inhibits the "translocation" step of translational elongation?
A. erythromycin  
B. puromycin  
C. streptomycin  
D. chloramphenicol

25. When you run out of glycogen while exercising, it is called "hitting the..."
A. door  
B. bottle  
C. professor  
D. sack  
E. wall  
F. this is a "freebie"
PART II Answer these questions here on the question pages.

1. a. Diagram the Glycogen Breakdown Cascade, starting with Epinephrine and ending with Glucose-1-P.

   (5)

b. Show the beta-oxidation of fatty acids -- fill in the details on the structures provided below. Don't forget to show cofactors!

   (5)

   \[
   \begin{align*}
   &\text{CH}_3 \quad \text{CH}_2 \quad \text{CH}_2 \quad \text{CH}_2 \quad \text{CH}_2 \quad \text{CO} \quad \text{SCoA} \\
   &\text{C} \quad \text{C} \quad \text{C} \quad \text{C} \quad \text{C} \quad \text{C} \quad \text{SCoA} \\
   &\text{C} \quad \text{C} \quad \text{C} \quad \text{C} \quad \text{C} \quad \text{C} \quad \text{SCoA} \\
   &\text{C} \quad \text{C} \quad \text{C} \quad \text{C} \quad \text{C} \quad \text{C} \quad \text{SCoA}
   \end{align*}
   \]

   you draw next step:
2. Show the cyclic portion of the Urea Cycle. Draw all reactants and products and indicate all cofactors.

(8)

b. Show the pathway from Pro to Glu - don't bother to show cofactors or enzymes, but do draw all intermediates.

(2)
3.  
a. What sequence is represented here? This is generated by the Sanger Dideoxy method, and you should give the strand sequenced, -- don’t bother deducing the other strand.

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b. Show the pathway from Phenylalanine to dopamine, which is the first part of the pathway to Epinephrine. Draw reactants and products and indicate cofactors.

(5)
4. a. Draw a replication fork, and indicate lagging and leading strands, Okazaki fragments, etc. Name 7 enzymes or proteins required for replication in E. coli.

(5)

b. Diagram the main features of a Promoter region as described in class.

(2)

c. Explain 2 ways that Transcription terminates in prokaryotes.

(3)
5. a. Diagram the Elongation process for procaryotic translation. Be sure to name all Factors and cofactors as well as showing the ribosomes etc. as done in class. Name each step of Elongation.

(7)

b. How is translation terminated? Show what happens when a Stop codon is reached and name all relevant factors.

(3)