

**Bio 366: Biological Chemistry II**  
**Final Exam, 100 points**

**READ THIS:** Take a numbered test and sit in the seat with that number on it. Remove the numbered sticker from the desk, and stick it on the back of the last page of the test. Print the last four digits of your social security number on the back of the test, and your name on the front top of each page. When you have finished, hand in your test and sign your name on the sign-out sheet by the door. The answers will be posted outside of my office (Bio 229) by this afternoon. If you wish to challenge an answer, give me a written explanation as soon as possible.

**A. True or False. Circle the correct answer. (1 point each, 30 points total.)**

1. T F RNA binding factors are used during mRNA transport across nuclear membranes.
2. T F Mammals are evolutionarily-related to photosynthetic bacteria.
3. T F All DNA polymerases need "primers" to initiate DNA synthesis.
4. T F UV irradiation causes dimerization of adjacent thymine bases in DNA; this is the most common form of UV damage to DNA.
5. T F Ornithine and citrulline are fatty acids.
6. T F The only known cause of Familial Hypercholesterolemia (FH) is lack of synthesis of the LDL receptor.
7. T F Glucose is the principal metabolic fuel for the brain; the concentration of glucose in the bloodstream must be maintained at about 5mM for this purpose.
8. T F *E. coli* DNA polymerase I has its own "proofreading" and "editing" functions.
9. T F Most aminotransferases use pyruvate as the acceptor.
10. T F Only 3'-OH aminoacyl-tRNAs are substrates for protein synthesis.
11. T F Deamination of cytosine in DNA can occur spontaneously.
12. T F Many biological polymerization processes are characterized by three phases: initiation, elongation, and termination.
13. T F A single pathway exists for the regulation of adipose (fat) tissue.
14. T F Fat soluble vitamins (such as vitamins A and K) and carotenoids (such as  $\beta$ -carotene) can partition into olestra.
15. T F During splicing of nuclear mRNA precursors, a covalently closed loop of RNA, called the *lariat*, is formed via a 2'-5' phosphodiester bond.
16. T F Eicosanoids are 20-carbon fatty acids.
17. T F Lipoproteins are particles of covalently-associated lipids and proteins.
18. T F Small molecules must be taken up by cells using a process called receptor-mediated endocytosis.
19. T F Fatty acids are metabolized anaerobically.
20. T F Reactive oxygen species are generated during normal aerobic respiration.
21. T F Digestion of lipids in the small intestine takes place in the presence of bile acids, which emulsify the fats.

22. T F During DNA synthesis, but not RNA synthesis, the incoming base is selected by Watson-Crick base pairing to the template strand.
23. T F The synthesis of UDP-glucose is driven by hydrolysis of PP<sub>i</sub>.
24. T F If glucose is not obtained in the diet, the body must produce new glucose from noncarbohydrate precursors, a process known as gluconeogenesis.
25. T F The amino acids are degraded by (at least) 20 different pathways that converge to just 4 common metabolic intermediates: acetyl-CoA, acetoacetate, pyruvate, and  $\alpha$ -ketoglutarate.
26. T F The densities of lipoprotein particles increase as their diameters increase.
27. T F Glucose-6-phosphate diffuses freely across cell membranes.
28. T F The three-dimensional structures of all known DNA polymerases look like a "hand and thumb", and the DNA molecule fits in the "palm" of the protein.
29. T F Most mutagens that cause nucleotide substitutions cause transversions.
30. T F You have printed your name at the top of each page and the last four digits of your social security number on the back of the last page. (This should be TRUE, but if you do not do this, you will lose the point!)

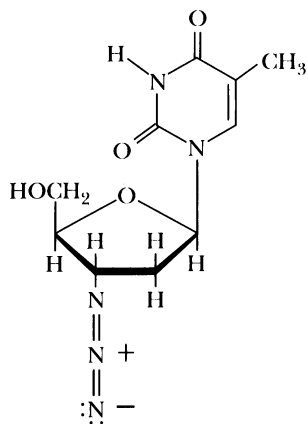
**B. Match the enzyme/protein/process [1 point each; 40 points total]: Write the correct number(s) in the blank next to the statement. Some have more than one correct answer; list them all for full credit. The same number may be used for more than one answer, or may not be used at all. Note: "none of the above" is NOT one of the possible answers this time.**

1. \_\_\_\_\_ This protein can exist in two forms; its normal  $\alpha$ -helical form can change shape into a harmful, disease-causing form, which forms filamentous aggregates that can damage neuronal tissue.
2. \_\_\_\_\_ Many biochemical reactions are rendered essentially irreversible by the action of this enzyme.
3. \_\_\_\_\_ Small segments of RNA that have catalytic ability.
4. \_\_\_\_\_ *In vitro* evolution has been used to isolate an RNA pseudoknot that can act as an inhibitor of this important anti-AIDS drug target.
5. \_\_\_\_\_ Add amino acids directly to the 3'-OH of the 3'-terminal adenine of their cognate tRNAs.
6. \_\_\_\_\_ Statin drugs, such as lovastatin, inhibit this enzyme.
7. \_\_\_\_\_ Reduces NDPs to dNDPs.
8. \_\_\_\_\_ Is secreted by killer T cells, and forms pores in the membranes of the cells that are targeted for destruction.
9. \_\_\_\_\_ Is induced by the inflammatory response, and is the target of specific NSAIDS (non-steroidal anti-inflammatory drugs).

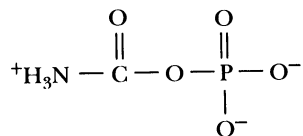
10. \_\_\_\_\_ Together these enzymes digest dietary starch and glycogen to their monomeric units.
11. \_\_\_\_\_ Recent experiments have suggested that peptide C of this hormone may be involved in glucose regulation.
12. \_\_\_\_\_ The first glucose residue of glycogen is covalently joined to this protein via an acetal linkage to a tyrosine-OH group.
13. \_\_\_\_\_ Many hormones act on the cell surface to stimulate this enzyme, which increases intracellular concentrations of cAMP.
- \*14. \_\_\_\_\_ Over 200 different mutations in the gene for this enzyme can lead to the disease phenylketoneuria (PKU).
15. \_\_\_\_\_ Removes the thymine in T-G mismatches of DNA.
16. \_\_\_\_\_ Has RNA-directed DNA polymerase, DNA-directed DNA polymerase, and RNase H (ribonuclease) activities.
17. \_\_\_\_\_ Bind tRNAs through contacts along and around the inside of the L-shaped tRNA.
18. \_\_\_\_\_ Caps the 5'-end of eukaryotic mRNAs.
19. \_\_\_\_\_ Has helix-turn-helix (HTH) motifs embedded within it.
20. \_\_\_\_\_ Converts hypoxanthine to xanthine *and* xanthine to uric acid.
21. \_\_\_\_\_ Has both oligo( $\alpha$ 1,4 $\rightarrow$  $\alpha$ 1,4)glucantransferase and  $\alpha$ (1 $\rightarrow$ 6) glucosidase activities.
22. \_\_\_\_\_ Interconverts glucose-1-phosphate and glucose-6-phosphate.
23. \_\_\_\_\_ Enzyme 1 is inhibited by glucose-6-phosphate, whereas Enzyme 2 is stimulated by this molecule; thus, activation and inhibition of these two enzymes are tightly linked. List these two enzyme in order (#1 then #2).
24. \_\_\_\_\_ Interacts with the cytoplasmic domain of the LDL receptor to help form coated pits and vesicles.
25. \_\_\_\_\_ Its manganese complex is the site of photolysis.
26. \_\_\_\_\_ The major protein found in chloroplasts, and perhaps the most abundant protein on the planet.
27. \_\_\_\_\_ Reduces the disulfide bond in the active site of ribonucleotide reductase; its active site is on a thumb-like projection.
28. \_\_\_\_\_ The three major *enzymes* involved in glycogen synthesis.
29. \_\_\_\_\_ Uses nucleotides containing either ribose and deoxyribose as substrates.
30. \_\_\_\_\_ Catalyzes this reaction: glutamate + NAD(P)  $\leftrightarrow$   $\alpha$ -ketoglutarate + NH<sub>4</sub><sup>+</sup>



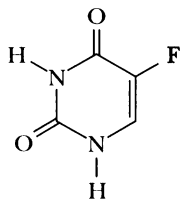
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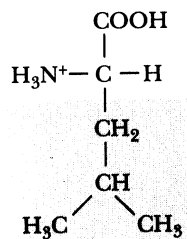
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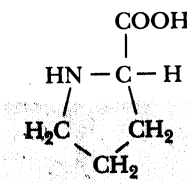
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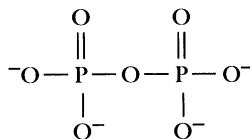
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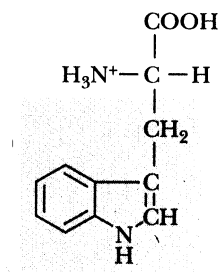
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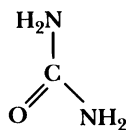
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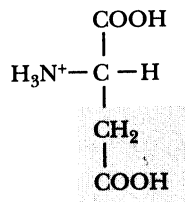
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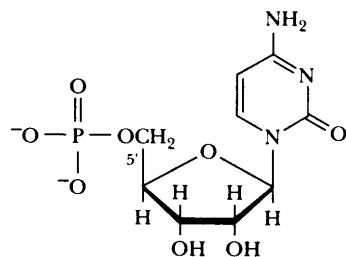
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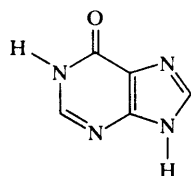
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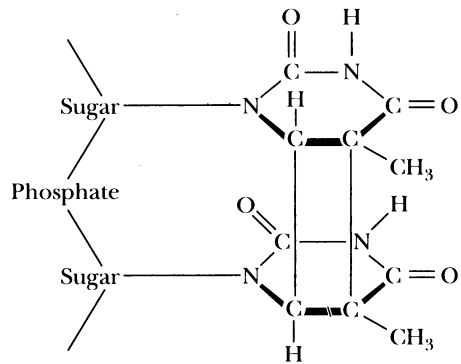
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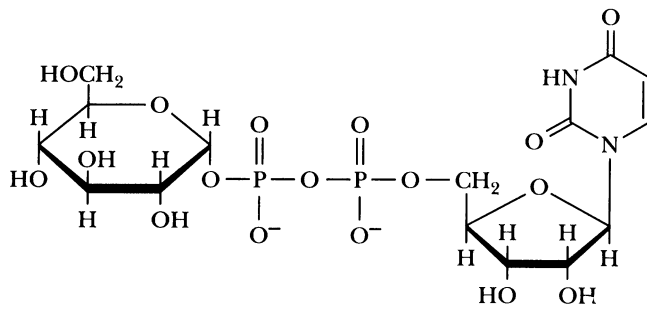
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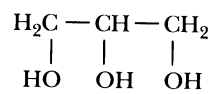
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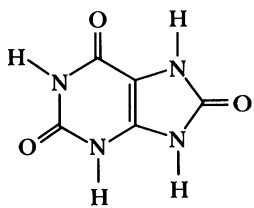
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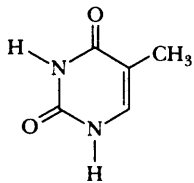
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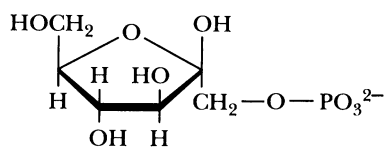
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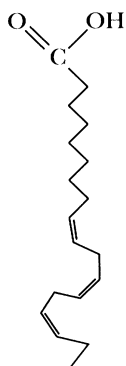
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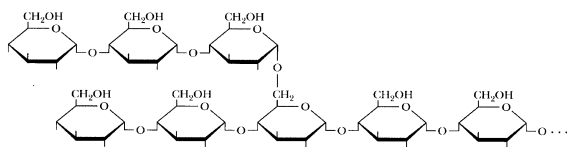
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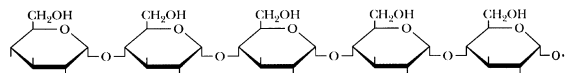
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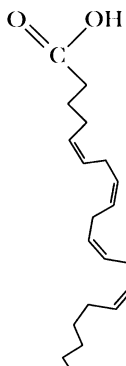
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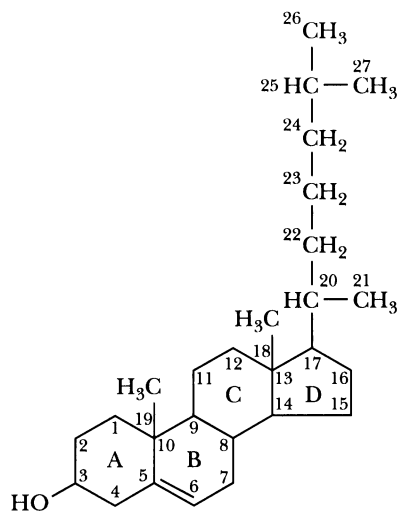
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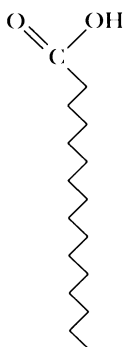
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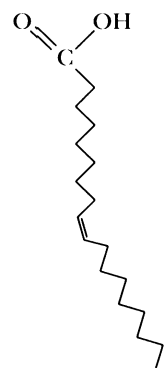
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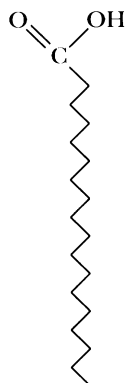
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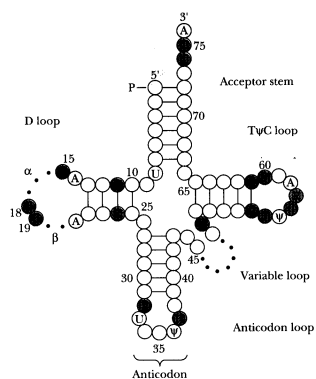
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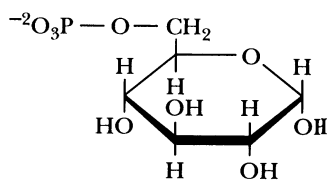
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