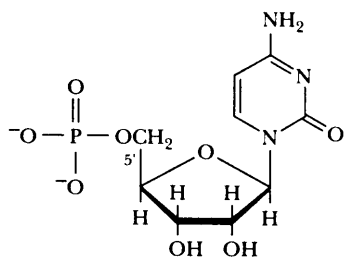


Bio 366: Biological Chemistry II
Final Exam, 100 points total

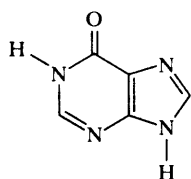
Please neatly print your name on the top of each page, and put the last four digits of your social security number and the sticker from your desk on the back of the last page. Take the full 2 hours, if necessary. The answers will be posted outside Dr. Stewart's office by this afternoon. If you wish to challenge an answer, please do so in writing as soon as possible, as the grades need to be in by tomorrow.

A. (1 point each, 30 points total) Using the attached key, identify the compounds below (by number from the key). Some compounds may have more than one name listed; for full credit, identify all appropriate names listed. Not all names listed on the key match one of these structures, and not all structures may have their names listed (NOTE: #70 = "NONE OF THE ABOVE").

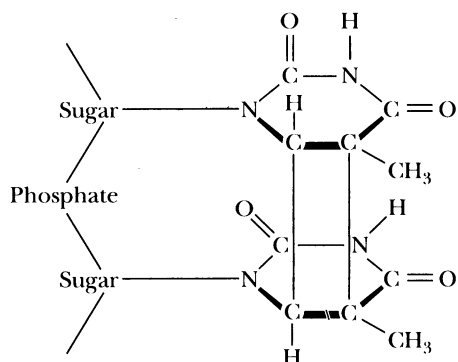
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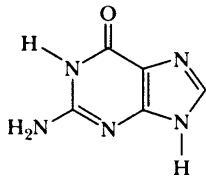
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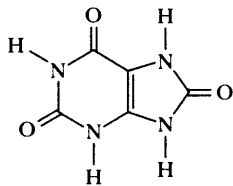
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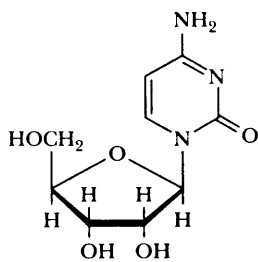
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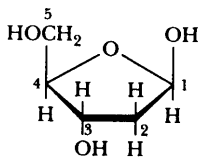
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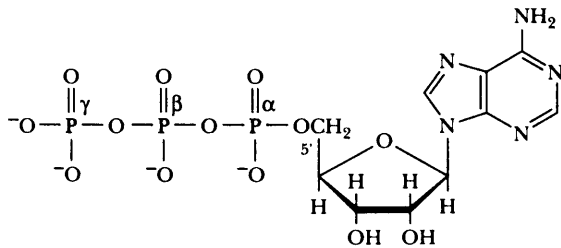
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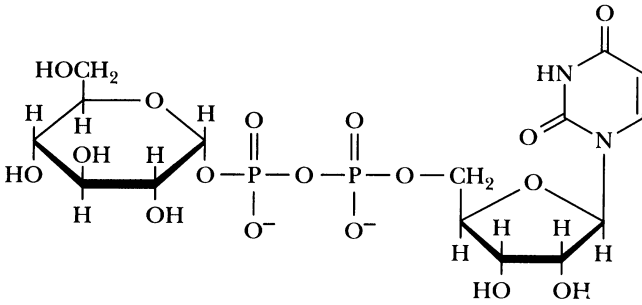
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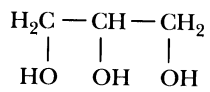
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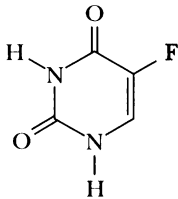
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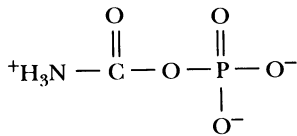
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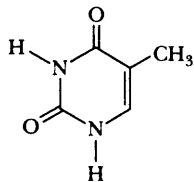
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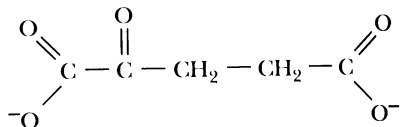
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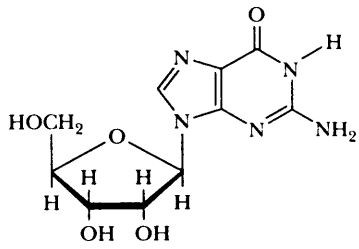
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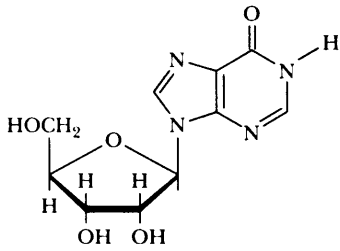
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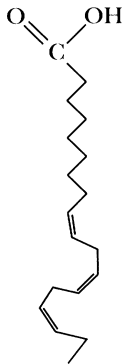
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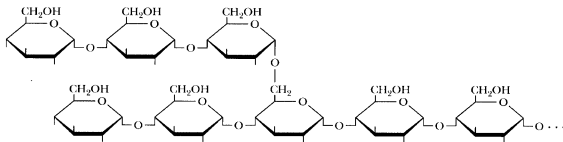
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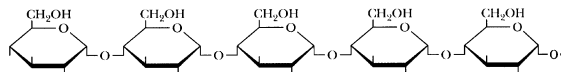
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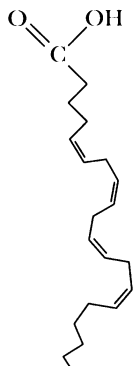
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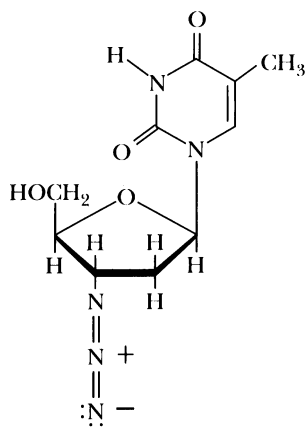
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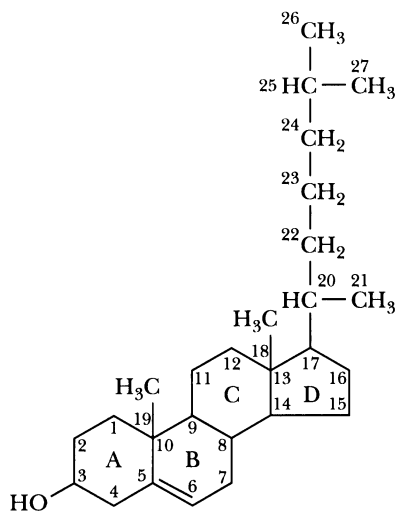
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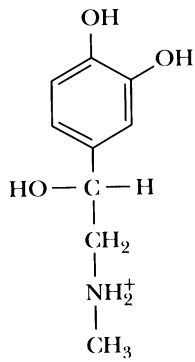
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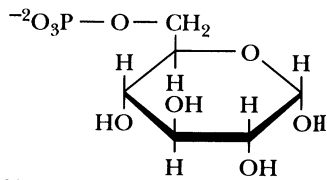
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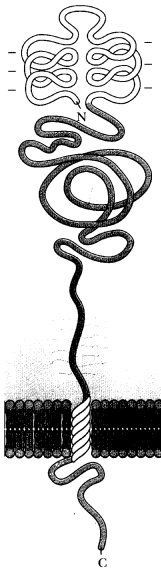
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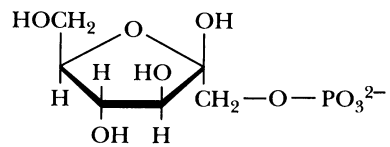
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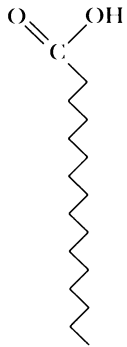
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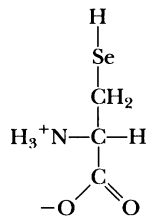
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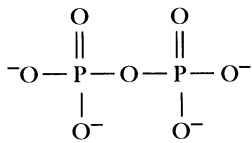
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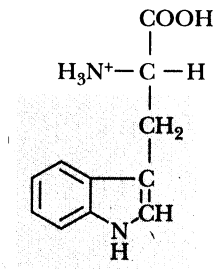
28.



29.



30.



B. Match the enzyme/protein/process (1 point each; 40 points total):

Using the attached key, write the number of the correct answer(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.

1. _____ High cholesterol levels causes the cleavage of this protein, which helps regulate the level of transcription of the LDL receptor gene.
2. _____ Catalyzes this reaction: $\text{H}_2\text{O} + \text{PP}_i \rightarrow 2\text{P}_i$
3. _____ A pancreatic digestive enzyme that leaves lysine and arginine off of the carboxyl end of proteins and peptides.
4. _____ Small strands of RNA that can act as catalysts.
5. _____ Catalyzes this reaction: $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$
6. _____ Decarboxylates L-glutamate to GABA, an inhibitory neurotransmitter.
7. _____ Catalyzes this reaction:
 $\text{RNA}_{(N \text{ residues})} + \text{NTP} \leftrightarrow \text{RNA}_{(N+1 \text{ residues})} + \text{PP}_i$
8. _____ Catalyzes this reaction: $\text{GDP} + \text{ATP} \leftrightarrow \text{GTP} + \text{ADP}$
9. _____ Catalyzes this reaction:
 $\text{Amino acid } 1 + \alpha\text{-keto acid } 2 \leftrightarrow \alpha\text{-keto acid } 1 + \text{Amino acid } 2$
10. _____ Catalyzes this reaction:
 $\text{glucose-1-phosphate} \leftrightarrow \text{glucose-6-phosphate}$
11. _____ The $G\alpha$ subunit of this protein has an intrinsic GTPase activity.
12. _____ Is inhibited by allopurinol, a drug used in gout treatment.
13. _____ Catalyzes this reaction: $\text{dUTP} + \text{H}_2\text{O} \leftrightarrow \text{dUMP} + \text{PP}_i$
14. _____ Has two NTP binding sites, an initiation site that binds purines and an elongation site.
15. _____ Hydrolyzes "olestra" in the digestive tract.

16. _____ The ulcer-causing bacterium, *Helicobacter pylori*, uses this enzyme to neutralize stomach acid by converting urea to HCO_3^- and $2(\text{NH}_4^+)$
17. _____ Has $\alpha(1\rightarrow4)$ transglycosylase activity.
18. _____ An endoprotease that cleaves after arginines and lysines.
19. _____ Catalyzes this reaction:
glutamate + NAD(P) \leftrightarrow α -ketoglutarate + NH_4^+
20. _____ Catalyzes this reaction: $2 \text{O}_2^{\bullet-} + 2 \text{H}^+ \rightarrow \text{H}_2\text{O}_2 + \text{O}_2$
21. _____ Deficiency causes the genetic disorder phenylketonuria (PKU).
22. _____ Catalyzes this reaction: $\text{AMP} + \text{ATP} \leftrightarrow 2 \text{ADP}$
23. _____ Uses nucleotides containing either ribose and deoxyribose as substrates.
24. _____ Its deficiency causes Lesch-Nyhan Syndrome and it catalyzes this reaction: hypoxanthine + PRPP \leftrightarrow IMP + PP_i
25. _____ Reduces the disulfide bond in the active site of ribonucleotide reductase *in vivo*, thus regenerating the enzyme.
26. _____ Is the major control point in cholesterol synthesis.
27. _____ Inhibition by NSAIDs of this *inducible* isozyme results in reduction of pain, inflammation, and fever.
28. _____ Catalyzes this reaction: $\text{dNDP} + \text{NTP} \leftrightarrow \text{dNTP} + \text{NDP}$
29. _____ Interacts with the cytoplasmic domain of the LDL receptor to help form coated pits and vesicles.
30. _____ FdUMP is a mechanism-based inhibitor of this enzyme.
31. _____ Digests triacylglycerols at cell surfaces.
32. _____ Are proteins that can assist other proteins in folding.
33. _____ Digests dietary starch in the human digestive tract.
34. _____ Removes supercoils from DNA undergoing transcription.

35. _____ The three major enzymes involved in glycogen degradation within cells.
36. _____ Many hormones act on the cell surface to stimulate this enzyme, which increases intracellular concentrations of cAMP.
37. _____ Function to transport dietary triacylglycerols from the intestines to the tissues, and dietary cholesterol to the liver.
38. _____ Can elongate preexisting chains of nucleic acids, but cannot join two nucleotides together to make the initial phosphodiester bond.
39. _____ Methotrexate, an anticancer drug, inhibits this enzyme.
40. _____ The three major enzymes involved in glycogen synthesis.

C. True or False. Circle the correct answer. 1 point off for each incorrect or unanswered question. (1 point each; 30 points total).

1. T F You have printed your name on the front top of each page and the last correct answer should be T, but if you mark it falsely, you will lose the point!
2. T F Filoviruses, such as Ebola virus, are RNA viruses that are highly pathogenic.
3. T F Bile acids act as detergents to emulsify fats.
4. T F Thioredoxin is the final reducing agent of the ribonucleotide reductase-mediated reduction of NDPs to dNDPs.
5. T F Cellulose is the primary structural component in plant cell walls, and is freely digested by mammalian gut enzymes.
6. T F The 20 standard amino acids are degraded by different pathways that converge to just 6 common metabolic intermediates: acetyl-CoA, acetoacetate, pyruvate, oxaloacetate, succinyl-CoA, and urea.
7. T F Birds excrete nitrogen waste, both from amino acid and nucleotide metabolism, as an insoluble mixture of urea and ammonia.
8. T F The densities of lipoproteins increase as their diameters increase.
9. T F Saturated fatty acids can pack together tightly because they are linear molecules.
10. T F Most aminotransferases use α -ketoglutarate as the acceptor.
11. T F Triacylglycerols are stored in adipocytes, or fat cells.
12. T F Lipoproteins are particles of covalently-associated lipids and proteins.
13. T F Secretion of bile acids to the gut, and their subsequent digestion by bacteria, is a major means of removal of cholesterol from the body.
14. T F Fatty acids can be used for energy during aerobic, but not anaerobic, exercise.
15. T F Excess protein, carbohydrates, and fat in the diet are all converted to fat for long-term storage of energy.

16. T F The incoming base is selected by Watson-Crick base pairing to the template strand during the chain elongation step of DNA, but not RNA, synthesis.
17. T F The only known biological use of the base thymine (T) is for DNA synthesis.
18. T F PP_i is released during DNA synthesis.
19. T F Receptor-mediated endocytosis is a general mechanism by which cells take up small charged molecules, such as glucose-6-phosphate.
20. T F In the "standard" genetic code, the amino acids cysteine and tryptophan are specified by a single codon.
21. T F RNA is the only molecule that, if damaged, is repaired by the cell.
22. T F Systemic lupus erythematosus (SLE) is an autoimmune disease for which several drug new treatments exist.
23. T F Urea is synthesized in the pancreas by enzymes of the urea cycle.
24. T F Ornithine and citrulline are amino acids.
25. T F High ammonia concentrations are toxic to animals.
26. T F During the urea cycle, the two nitrogen atoms of urea are contributed by ammonia and glutamate.
27. T F Leucine and lysine are the only two purely ketogenic amino acids.
28. T F Elemental nitrogen (N_2) is very stable, and must be converted to metabolically useful forms.
29. T F UTP and CTP are derived from UMP by the same, unbranched pathway.
30. T F ADP, CDP, TDP, and GDP are all substrates for *E. coli* ribonucleotide reductase.