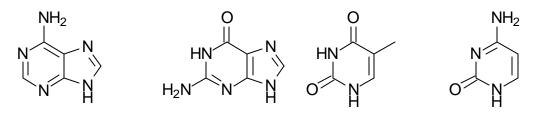
Points			Page	Points
(9)	1.	Mammalian cells have two forms of the enzyme carbamoyl		
		phosphate synthetase. Identify:	1	
		(a) the reactants and products of each form;	2	
		(b) the cellular location of each form; and	3	
		(c) the biochemical pathway in which each form participates.	4	
			Total	

(9) 2. Using partial structures to designate the tetrahydrofolic acid (i.e., showing just the N_5 and N_{10} positions of the molecule), give the structure of the following C₁-derivatives of THF:

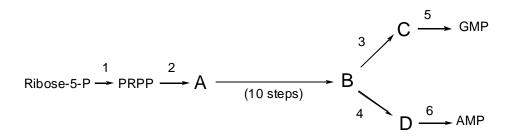
- (a) The product formed from serine.
- (b) The precursor of the 2 position of purines.
- (c) The C_1 donor in thymidylate biosynthesis.
- (d) Donor of the methyl group in methionine biosynthesis
- (a) (b) (c) (d)

(12) 3. For the following purines and pyrimidines, enter the **name** of each base in the blank below the structure. For each base, **circle** each nitrogen atom that is derived from **glutamine**, and put an **X** through each nitrogen atom that is derived from **aspartate**.



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4. Following is an outline of the purine biosynthetic pathway:



(12)

(a) Give the **structure** and **name** of the lettered intermediates:

A B C D

(6) (b) Identify by the number(s) (from 1-6) in the scheme above the step or steps which:

- _____ Use ATP as a cosubstrate
- _____ Use GTP as a cosubstrate
- _____ Use NAD as a cosubstrate
- _____ Use glutamine as a cosubstrate
- _____ Are inhibited by GMP
- _____ Are inhibited by AMP
- (7) 5. Complete the following table by identifying the DNA structures described:

Helix Direction:	Right	Right	Left
Base Pairs/Turn	11	10.4	12
Base Tilt	19 ^o	1.2°	9°
Diameter (Å)	2.55	2.37	1.84
Name of Structure			

Which helical structure does double stranded RNA form?

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- (6) 6. Compare and contrast type I and type II topoisomerases with respect to their:
 - (a) effect on **L**, **T**, and **W** of a negatively supercoiled plasmid.
 - (b) effect on **L**, **T**, and **W** of a positively supercoiled plasmid.
- (9) 7. Deamination of bases can be a source of mutations in DNA. For each of the following possible deaminations, explain what type of mutation would occur in the DNA sequence (i.e. $AT \rightarrow GC$ transition, $GC \rightarrow AT$ transition, purine \rightarrow pyrimidine transversion, pyrimidine \rightarrow purine transversion, insertion, or deletion)

(a) Deamination of cytosine

(b) Deamination of Adenine

(c) Deamination of Guanine

(4) 8. Diagram a Holliday junction between two DNA double strands, labeling the 5'- and 3'- ends of each of the four DNA strands. (You need not draw a helix, but show where two strands are complementary and form a helix.)

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- (12) 9. For each of the following metabolic diseases, identify the **missing or defective enzyme** and the **product accumulated** (name or structure).
 - (a) Alkaptonuria
 - (b) Lesch Nyhan Syndrome
 - (c) Phenylketonuria
 - (d) Hyperammonemia
- (6) 10. Explain the regulation of ribonucleotide reductase. dATP has two kinds of regulatory effects on this enzyme. Explain them.

(8) 11. Pyrimidine biosynthesis is regulated by "end product feedback inhibition" in both bacteria and animals. However, the site of enzyme regulation is different in the two cases, and the allosteric effectors (activators and inhibitors) are also different. Describe the differences by filling in the following table.

Organism	Regulated Enzyme	Allosteric activator(s)	Allosteric inhibitor(s)
bacteria			

animal