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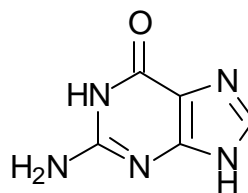
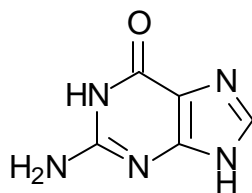
- (6) 1. Using partial structures to designate the tetrahydrofolic acid (i.e., showing just the N₅ and N₁₀ positions of the molecule), give the structure of the following C₁-derivatives of THF:
- The product formed from serine.
 - The precursor of the 2 position of purines.
 - The C₁ donor in thymidylate biosynthesis.

(a)

(b)

(c)

- (6) 2. Following are two structures, of a purine.
- Give the **name** of the purine.
 - In the first structure **circle** each **nitrogen atom** that is derived from **glutamine**, and put an **X** through each **nitrogen atom** that is derived from **aspartate**.
 - In the second structure **circle** each **carbon atom** that is derived from **CO₂**, and put an **X** through each **carbon atom** that is derived from **N₁₀-formyl THFA**.



Name _____

- (4) 3. What enzyme is inhibited by the drugs **aminopterin** and **amethopterin**, and why are these drugs effective in blocking the growth of cancer cells?
- (6) 4. What enzyme is deficient in Lesh-Nyhan syndrome, what product accumulates, and how does deficiency of this enzyme cause the accumulation of this product?

(5) 5. Ribose is first activated before incorporation into either purine or pyrimidine nucleotides. Draw the structure of this activated form of ribose.

(6) 6. Complete the following table by naming the nucleoside containing the indicated base and sugar. An example is given in the first row.

Base	Sugar	Nucleoside
adenine	deoxyribose	deoxyadenosine
guanine	ribose	_____
cytosine	deoxyribose	_____
thymine	ribose	_____

(8) 7. The urea cycle extracts a nitrogen atom from aspartate for the production of urea, the other nitrogen coming from ammonia liberated from glutamate. An alternative way of utilizing the nitrogen of aspartate to form ammonia makes use of two steps of purine biosynthesis (the steps in which IMP is converted to AMP) coupled to the enzyme **AMP deaminase**, which converts AMP to IMP and ammonia. These steps form a cycle that is referred to as the **purine cycle**. Write out these three reaction steps, giving the reactants and products of each step (names or structures okay), and give the overall reaction catalyzed by the purine cycle.

(4) 8. Some of the eukaryotic enzymes of the purine biosynthetic pathway are covalently linked as part of the same polypeptide chain. What advantage does this organization provide to the organism?

(6) 13. 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°	1.2°	9°
Diameter (Å)	2.55	2.37	1.84
Name of Structure	_____	_____	_____

Which helical structure does double stranded RNA form?

(6) 14. Suppose that negatively supercoiled DNA with $L=23$, $T=25$, and $W=-2$ is acted upon by topoisomerase I. After one catalytic cycle, what would be the values of L , T , and W ?

Suppose that negatively supercoiled DNA with $L=23$, $T=25$, and $W=-2$ is acted upon by DNA gyrase (a type II topoisomerase) and ATP. After one catalytic cycle, what would be the values of L , T , and W ?

(8) 15 DNA Polymerase I from bacteria has three enzymatic activities.

(a) Explain what each does during DNA replication:

5'-3' polymerase

3'-5' exonuclease

5'-3' exonuclease

(b) Explain how Polymerase I participates in the normal DNA replication process in bacteria.