1. Please name 4 different functions of nucleotides: Any of the following is correct
    a. Precursors for nucleic acid synthesis: DNA, RNA
    b. ATP is the prime energy source for biologic processes, although GTP is sometimes used.
    c. Nucleotides can activate biomolecules for synthetic reactions: (such as UDP-glucose, CDP-ethanolamine)
    d. Nucleotides and derivatives are important parts of many second messenger systems: Cyclic AMP, Cyclic GMP
    e. ATP is a source of phosphate for kinase reactions

2. Lesch-Nyhan Syndrome results from a defect in what enzyme? (abbreviations are fine here) Hypoxanthine Guanosine Phosphoribosyl Transferase HGPRT_____

3. PKU is a disorder of what process? Catabolism of phenylalanine to tyrosine.

4. Please write the DNA complement to this region of DNA; be sure to write this sequence according to the proper convention: 5' AGCTA 3': **5'TAGCT3'**

5. The proper RNA compliment would be:_ **5'UAGCU3'**

6. Please list the two amino acids that are ketogenic only___Lysine, Leucine

7. Please list the essential amino acids: Histidine, Isoleucine, Methionine, Phenylalanine, Threonine, Tryptophan, Leucine, Lysine, Valine, Arginine,

8. CTP is derived from amination of _____UTP_____

9. Please list the Basal trascription factors present at the initiation site prior to the start of transcription. TFIID, TFIIA, TFIIB, TFIIF, TFIIE, TFIIH.

10. Please describe the function of RF-Tu during the elongation process :
GTP-bound EF-Tu escorts the incoming amino acyl-tRNA to position A in 70S subunit of the ribosome during elongation. Once the correct association with the ribosome and mRNA has been made, the GTP is hydrolyzed to release GDP-EF- Tu.

1. Which of the following is a ***true*** statement?
    a. During replication, DNA is polymerized in the 3' to 5' direction
    b. **The polymerization of DNA requires a primer with a free 3' hydroxyl.**
    c. Th telomerase enzyme carries a DNA template for the synthesis of telomeres.
    d. Replication initiation factors in prokaryotes includes the factor, mcm2-7.

2. Which of the following is ****false**** regarding purine synthesis:?
    a. The enzyme that catalyzes the first committed step is glutamine phosphoribosyl amidotransferase
    b. In the first committed step, ammonia from glutamine is covalently linked to 5-phosphoribosyl-1-pyrophosphate (PRPP) to yield phosphoribosylamine (also called 5-phosphoribosyl-1-amine
    c. Purine bases are constructed on PRPP rather than being built as a unit apart from PRPP.
    d. Only the bases adenine and guanine are formed during purine synthesis.

3. UV light can induce mutations by covalently crosslinking Thymine bases, which are next to one another in the DNA sequence to form thymine dimers. **T** F

4. We humans can resolve thymine dimers directly through the enzyme photolyase. T **F**

5. Which of the following is a ***true*** statement?
    a. The purine nucleotide, inosinate (IMP) is an important intermediate in purine nucleotide synthesis
    b. During purine nucleotide catabolism, the purine base inosine is converted to Xanthine
    c. Uric acid, under physiologic conditions dissociates to form urate and a proton.
    d. Urate is an excellent antioxidant, and in higher primates, is found in concentrations close to saturation.
    e. a-d are true

6. What is the difference between GDP and dGDP?
    a. dGDP has an extra amino group attached to carbon 6 in the purine ring.
    b. dGDP has an extra phosphate attached to the 2' carbon of the ribose.
    c. dGDP is reduced at the 2' carbon of the ribose.
    d. dGDP is reduced at carbon 6 of the purine ring

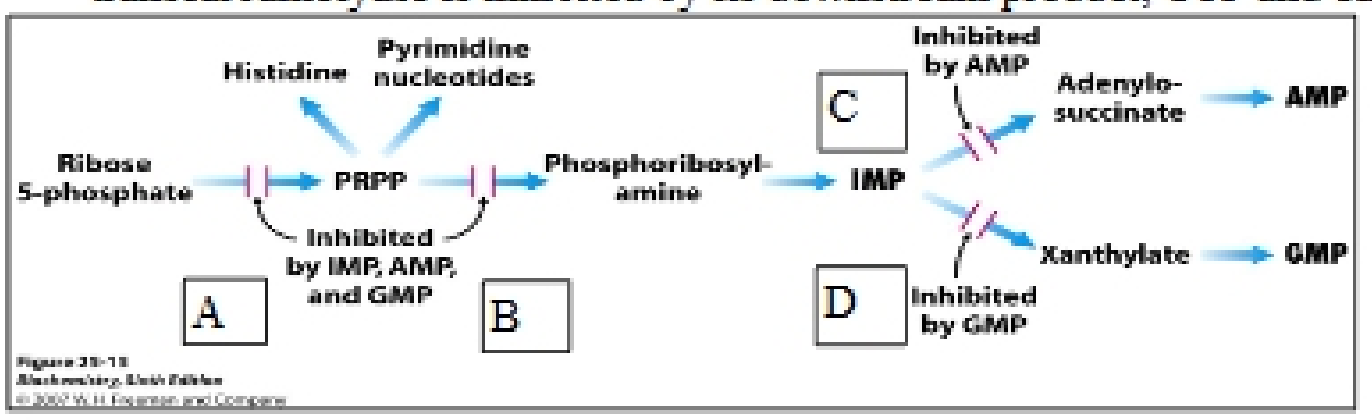
7. Which of the following is a ***false*** statement:
    a. Adenosine Deaminase (ADA) Deficiency results in severe combined immunodeficiency
    b. Gout is a condition resulting from the precipitation of allopurinol in the joints
    c. Thymidylate (TMP also known as dTMP) synthesis is a prime target for chemotherapeutic treatments such as methotrexate and the suicide inhibitor, flurodeoxyuridylate.

d. Sulfonamides are used to block folate synthesis in bacteria.

8. Deficiency in folic acid is linked to neural tube anomalies like spina bifida. T F

9. Which of the following is a ***false*** statement?
   a. In the purine salvage pathway, HGPRT, and APRT transfer a salvaged purine base to a PRPP platform
   b. The products of HGPRT are GMP or IMP, and pyrophosphate, and the reaction is driven forward by PPi hydrolysis to yield 2Pi
   c. Lesch-Nyhan Syndrome is an X-linked recessive mutation that results in a defect in the enzyme, HGPRT (hypoxanthine, guanine phosphoribosyl transferase.
   d. Pyrimidines are synthesized strictly *de novo*, as there is no pyrimidine salvage pathway.

10. Control of pyrimidine synthesis occurs through feedback inhibition: aspartate transcarbamolyase is inhibited by its downstream product, CTP and carbamoyl phosphate



and carbamoyl phosphate synthetase is inhibited by carbamoyl phosphate. FALSE

Please use the figure above to answer the following question:

11. Inhibition of the pathway by GMP at point B would have what effect?
   a. pyrimidine synthesis would slow down
   b. synthesis of all purines would slow down
   c. synthesis of all purines would not be affected
   d. synthesis of GMP alone would slow down
   e. a) and c)

12. Which of the following is a ***false*** statement?
   a. B-DNA is a right-handed helix
   b. B-DNA is the most common conformation of DNA under physiologic conditions.
   c. Differences in DNA conformation is not a factor in the targeting of proteins to specific DNA targets, as this targeting relies on DNA sequence alone.
   d. Z-DNA formation is favored by runs of alternating purines and pyrimidines.