1. Which **pyrimidine base** is **NOT** found in **ribonucleic acid (RNA)?**
   A. A
   B. C
   C. G
   D. T
   E. U.

2. Which **ONE** of the following is **the limiting substance** in the **biosynthesis of purines**?
   A. ribose-5-phosphate
   B. α-D-ribose-5-phosphate
   C. 5-phosphoribosyl-β amine
   D. formylglycinamidine ribonucleotide
   E. 5-phosphoribosyl-α-pyrophosphate (PRPP)

3. Which **ONE** of the following is the **common product** of **purine catabolism**?
   A. xanthine
   B. hypoxanthine
   C. uric acid
   D. inosine
   E. xanthosine

4. **Allopurinol** binds tightly to **xanthine oxidase** and **prevents uric acid** formation**.** To which **ONE** of the following **metabolites** is it **structurally similar?**
   A. uric acid.
   B. urea.
   C. xanthine.
   D. hypoxanthine**.**
   E. xanthosine.

5. Which **amino acids** are **essential** for the synthesis of the **pyrimidine ring**?
   A. aspartate and glutamate.
   B. alanine and glutamine.
   C. aspartate and glutamine.
   D. aspartate, glycine and glutamine.
   E. alanine, glycine and glutamate

6. **Nucleoside 5'-triphosphates** are **carriers of chemical energy**. Which **ONE** of the following statements is **TRUE**?
   A. ATP drives lipid synthesis.
   B. GTP drives protein synthesis.
   C. CTP drives carbohydrate metabolism.
   D. UTP drives energy metabolism.
   E. All of the above.

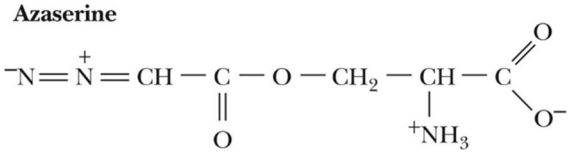
7. **Caffeine** promotes wakefulness by i**nhibiting** the binding of a **nucleoside** to its neuronal receptors. Which **one** of the following **nucleosides** is **caffeine similar to**?
   A. adenosine.
   B. cytidine.
   C. guanosine.
   D. inosine.
   E. uridine.

8. Which **one** of the following **metabolites** is generated by the **purine nucleotide cycle**?
   A. Aspartate.
   B. Fumarate.
   C. Oxaloacetate.
   D. Succinate.
   E. A and B.

9. Which **one** of the following **metabolites** from **thymine catabolism** is linked to **lipid breakdown** and has the potential to counter **diet-induced obesity**?
   A. malonyl Coenzyme A
   B. methylmalonyl Coenzyme A
   C. succinyl Coenzyme A
   D. β-aminoisobutyrate
   E. β-analine.

10. **Azaserine** functions as a **purine synthesis inhibitor** and is used as **an anti-tumour agent,** based on its structural similarity to the metabolite:
   A. Glycine
   B. Aspartate
   C. Glutamine
   D. N^{10}-formyl-tetrahydrofolate
   E. Inosine monophosphate.

Azaserine



11. **Ribonucleotides** are converted to **deoxyribonucleotides** for DNA by the process of:
   A. hydration.
   B. ligation.
   C. oxidation.
   D. reduction.
   E. condensation.

REFER TO THE **FOLLOWING INFORMATION** for **QUESTIONS 12-16:**

The following is the list of **naturally occurring purine and pyrimidine bases**:

Purines: adenine (**A**), guanine (**G**), hypoxanthine (**H**), xanthine (**X**), uric acid (**R**)

Pyrimidines: cytosine (**C**), uracil (**U**), thymine (**T**)

12. Which **purine** and **pyrimidine bases** listed above are found in **ribonucleic acid** (RNA)?
    A. Any four purine bases.
    B. Any two purine and two pyrimidine bases.
    C. **A, G, T** and **U**.
    D. **A, C, G** and **T**.
    E. All of the naturally occurring purine and pyrimidine bases.

13. **Uric acid** is the **end product** of:
    A. urea metabolism.
    B. nucleic acid catabolism.
    C. nucleic acid synthesis.
    D. purine catabolism.
    E. pyrimidine catabolism.

14. **Defective purine degradation** leads to the **disease**:
    A. gout.
    B. hyperammonemia.
    C. Lesch-Nyhan syndrome.
    D. phenylketonuria.
    E. spina bifida.

15. Which **purine base** is the **precursor** for the **mild stimulants** present in coffee, tea and cocoa?
    A. **A**.
    B. **G**.
    C. **H**.
    D. **U**.
    E. **X (answer)**

16. Which **nucleotide base** listed above is **NOT** found in **deoxyribonucleic acid (DNA)?**
    A. **A**.
    B. **R**.
    C. **T**.
    D. **C**.
    E. **G**.

Short Question:

Nucleic acid metabolism:

a. **Name** and **briefly describe the major pathways** involved in **nucleotide synthesis** (2 marks).
b. Which **amino acids** are **essential** for **nucleotide synthesis**? (3 marks)
c. Which **pathway links nucleic acid synthesis** to **sugar metabolism**? (2 marks)
d. **A metabolite** accumulates as the **end-product of purine catabolism**, causing a **painful disease**. **Name** the **metabolite**, the **disease** and how **this disease is treated**. (3 marks)