

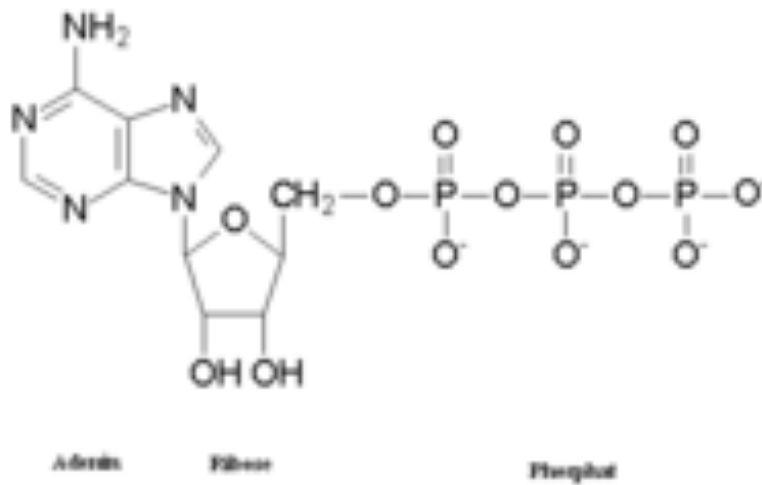
## Example questions for the Master of Biochemistry entrance exam

Please keep in mind that the entrance exam will be significantly longer (at least 20 questions) and that we will not use the example questions for the real entrance exam.

1. How are the following DNA lesions repaired? Name one mechanism for each case:
  - a) Thymine dimer,  
**Answer: light activated Photolyase**
  - b) DNA double strand break,  
**Answer: Homolog recombination or Non homologous end joining**
  - c) mismatched base pair.  
**Answer: Nucleotide excision repair or Base excision repair**
2. What are the three steps of pre-mRNA processing in eukaryotes?  
**Answer: 5'-capping, splicing, polyadenylation**
3. Name an example for an amino acid with a
  - (a) basic,
  - (b) acidic and
  - (c) aromatic side chain.**Answer:**
  - a) His, Lys, Arg
  - b) Asp, Glu
  - c) Tyr, Phe, Trp
4.
  - a) What is apoptosis?
  - b) What is the biochemical activity of caspases in this process?**Answer:**
  - a) Programmed cell death
  - b) Proteases
5. What is a
  - (a) karyotype,
  - (b) gonosome (allosome),
  - (c) autosome?**Answer:**
  - a) number and appearance of chromosomes in the nucleus of a eukaryotic cell
  - b) sex chromosome, defines the genetic gender of an individual
  - c) chromosome that does not define the gender of an individual
6. Name three metabolic functions or pathways that take place in the mitochondrion.  
**Answer: citric acid cycle (Krebs cycle),  $\beta$ -oxidation of fatty acids, respiratory chain, oxidative phosphorylation, amino acid degradation (partial),**

7. Draw the chemical structure of adenosyl triphosphate.

Answer:



8. What is the function of U1 and U2 snRNAs in mRNA splicing?

Answer:

U1 recognizes 5' splice site by base-pairing with 5' region of intron;  
U2 recognizes branch point and loops out adenosine for nucleophilic attack of 5' splice site

9. List the important functional elements of an *E. coli* plasmid vector.

Answer:

Replication of origin, antibiotic resistance gene, multiple cloning site or recombinase target sequences

10. Explain how the following chromatographic techniques separate proteins:

- affinity chromatography,
- size exclusion chromatography,
- hydrophobic interaction chromatography.

Answer:

- Purification of a particular protein using its specific affinity to an immobilized ligand
- Separation of proteins/particles based on their size
- Proteins are separated by hydrophobic interaction on columns with hydrophobic groups attached