

## Microbial Metabolism, Enzymes and ATP

### 1. Define:

**Metabolism** – Metabolism is the sum total of all chemical reactions occurring within a living organism. This includes anabolism (building reactions) and catabolism (breakdown reactions). Metabolism is a characteristic of life and is not typically attributed to viruses.

**Endergonic** – Endergonic reactions are chemical reactions that require an input of energy (they take up energy). Anabolic reactions require that energy be provided, and are endergonic.

**Ribozyme** - A ribozyme is a biochemical catalyst (compound capable of speeding up chemical reactions), composed of RNA. Peptidyl transferase (23S r-RNA) is one example of a ribozyme, and catalyzes the formation of peptide bonds between amino acids at ribosomes. The small RNA molecules found within spliceosomes also have ribozyme activity and are involved in post-transcriptional modification of RNA in eukaryotic cells.

**Constitutive enzymes** – Constitutive enzymes are those essential to cell function and so produced on a regular basis (produced constitutively). These enzymes are not controlled by induction or repression. DNA polymerase and RNA polymerase are examples of constitutive enzymes.

**Oxidation** – Oxidation reactions are chemical reactions that involve the addition of oxygen to or the removal of electrons and hydrogen protons from atoms or molecules. When electrons are removed from one molecule, they are typically added to another, so oxidation reactions and reduction reactions occur together. In the mnemonic device LEO the lion goes GER, LEO represents “loses electrons = oxidized”.

### 2. Bioenergetics/ endergonic

### 3. Metabolism/ enzymes/ ribozymes

### 4. Phosphorylation

### 5. Exergonic/ phosphorylation

### 6. ATP (adenosine triphosphate)/ GTP, CTP, UTP, etc. Nucleotide triphosphates that include ribose are called r-NTPs while those that include deoxyribose are called d-NTPs. Acetyl-coenzyme A (Acetyl-Co-A) and succinyl-coenzyme A (succinyl-Co-A) are also considered as high energy compounds.

### 7. Reduced

### 8. Oxidized

9. Increasing the interaction between molecules/ decreasing the increments of the energy of activation (activation energy) required to initiate chemical reactions.
10. Enzymes/ temperature, concentration (of enzyme or substrate), light and pH
11. Increase the rate at which chemical reactions occur. They may increase the speed of chemical reactions hundreds or thousands of times./ used over and over again.
12. Conjugated/ cofactors
13. Concentration/ competitive inhibitors
14. Allosteric
15. Exoenzymes
16. Coenzyme
17. Coenzymes/ riboflavin
18. NAD (Nicotinamide Adenine Dinucleotide)
19. Cytochromes/ prosthetic groups/ hydrogen protons
20. Matching letter sequence is - F, D, J, H, A, E, C, G, B and I.
21. Constitutive
22. Chemical reactions that result in the catabolism of proteins and lipids respectively/ add one or more carboxyl groups to a molecule/ builds a polymer such as DNA or RNA.