*Name: Okpiri Regina Tamara-meisinde*

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*Assignment*

*Itemize what heterotrophic cells do with the free energy obtained from the degradation of molecules.*

 *Within cells, these molecules are further degraded into still simpler molecules containing two to four carbon atoms. These fragments (acetyl-CoA for example) face one of two alternatives. They may proceed up various metabolic pathways and serve as the building blocks of, for example, sugars and fatty acids. From these will be assembled the macromolecules of the cell (e.g., polysaccharides, fats, proteins, and nucleic acids). Alternatively, the molecules in this pool of two- to four-carbon fragments may be still further degraded — ultimately to simple inorganic molecules such as carbon dioxide (CO2), H2O, and ammonia (NH3). This phase of catabolism releases large amounts of energy (in the form of ATP). One use to which this energy is put is to run the anabolic activities of the cell. The breaking down of food particles we consume and derive energy from is called metabolism. It covers various processes that use nutrients in food to release Gibbs free energy, which is stored during the formation of ATP from ADP. This stored energy in ATP is captured and used for various purposes in the body by converting ATP back to ADP.*

*Nutrient metabolism in the human body occurs via a complex series of enzyme-mediated reactions. According to Hans Krebs, there are three stages in metabolism:*

*Digestion*

***T****he breaking down of large biomolecules such as carbohydrates, lipids, and proteins to less complex, smaller molecules such as glucose, fatty acids, and amino acids, respectively. These simpler molecules can easily travel from the digestive tract and enter the bloodstream.*

*Conversion to acetyl CoA*

*The smaller molecules of glucose, fatty acids, and amino acids are converted to acetyl groups which get linked to coenzyme A forming acetyl coenzyme A, or acetyl CoA.*

*Oxidation of acetyl groups.*

 *The acetyl CoA is oxidized during the citric acid cycle or Krebs cycle. This oxidation reaction, which converts acetyl CoA to CO2 and H2O, is coupled with other reactions that produce ATP from ADP by a process called oxidative phosphorylation.*

*Energy is present in a variety of forms which are interconverted whenever energy is used for executing a task or when one form of energy is converted into another there is a loss of energy. This has lead to two fundamental laws of thermodynamics,State them.*

 *The [first law of thermodynamics](https://en.m.wikipedia.org/wiki/First_law_of_thermodynamics%22%20%5Co%20%22First%20law%20of%20thermodynamics): When energy passes, as [work](https://en.m.wikipedia.org/wiki/Work_%28thermodynamics%29%22%20%5Co%20%22Work%20%28thermodynamics%29), as [heat](https://en.m.wikipedia.org/wiki/Heat%22%20%5Co%20%22Heat), or with matter, into or out of a system, the system's [internal energy](https://en.m.wikipedia.org/wiki/Internal_energy%22%20%5Co%20%22Internal%20energy) changes in accord with the law of [conservation of energy](https://en.m.wikipedia.org/wiki/Conservation_of_energy%22%20%5Co%20%22Conservation%20of%20energy). Equivalently, [perpetual motion machines of the first kind](https://en.m.wikipedia.org/wiki/Perpetual_motion_machine_of_the_first_kind%22%20%5Co%20%22Perpetual%20motion%20machine%20of%20the%20first%20kind) (machines that produce work with no energy input) are impossible.*

*The [second law of thermodynamics](https://en.m.wikipedia.org/wiki/Second_law_of_thermodynamics%22%20%5Co%20%22Second%20law%20of%20thermodynamics): In a natural [thermodynamic process](https://en.m.wikipedia.org/wiki/Thermodynamic_process%22%20%5Co%20%22Thermodynamic%20process), the sum of the [entropies](https://en.m.wikipedia.org/wiki/Entropy%22%20%5Co%20%22Entropy) of the interacting [thermodynamic systems](https://en.m.wikipedia.org/wiki/Thermodynamic_system%22%20%5Co%20%22Thermodynamic%20system) increases. Equivalently, [perpetual motion machines of the second kind](https://en.m.wikipedia.org/wiki/Perpetual_motion_machine_of_the_second_kind%22%20%5Co%20%22Perpetual%20motion%20machine%20of%20the%20second%20kind) (machines that spontaneously convert thermal energy into mechanical work). are impossible.*