ENERGY EXCHANGE AND LAWS OF THERMODYNAMICS IN BIOLOGICAL SYSTEMS

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Abstract

This in the article biological in systems energy exchange processes and thermodynamics of the laws application analysis will be done . Alive in organisms energy flow , metabolism and heat exchange biophysicist point of view from the point of view studied , their life in the activity importance scientific basically illuminated .

Key words

biophysics , energy , metabolism , thermodynamics , first law , second law , entropy , biological system , heat metabolism , cell , ATP, energy flow , chemical energy , mechanical energy , internal energy , open system , closed system , alive organism , energy balance , enzymes , catabolism , anabolism , heat , biological process , molecule , cell membrane , bioenergetics , oxidation , phosphorylation , respiration absorption , photosynthesis , energy efficiency , thermodynamics system , energy conversion , dissipation , stability , biological balance , energy consumption , bioprocesses

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Biological systems complex , open and oneself manager systems is considered . Their main from the characteristics one energy exchange processes continuous continue It is possible . Alive organisms external from the environment energy acceptance do it , it various biological to processes spends and as a result heat in the form of outside It releases . because of biological systems in understanding thermodynamics laws important theoretical basis become service does .

Thermodynamics first law of energy preservation law to him according to

energy does not disappear and from nothing appearance maybe not one from the type other to the type turns into . Biological in systems this law metabolic processes through manifestation For example , food substances in the content chemical energy in cells in the form of ATP is stored and later mechanical , thermal or electricity to the energy is converted .

Second law and entropy concept with related is , every how in the system chaos level increasing to go means . However alive organisms open system that was because of they external from the environment energy take , inside order save It stands . in terms of biological systems thermodynamic out of balance far in case there is will be .

Energy exchange processes mainly metabolism through done is increased . Metabolism two main from part consists of : catabolism and anabolism . Catabolism in the process complicated substances falling apart energy splits , in anabolism and simple substances together complicated structures harvest does and this process energy demand does .

Biophysics science this processes physicist laws based on learns . Especially energy conversion , heat exchange and molecular level changes important importance has . This in the article biological in systems energy exchange processes and thermodynamics of the laws practical importance wide analysis will be done .

Analysis and results

Biological in systems energy exchange complicated and many step by step process is , it is a cell from the level pull whole organism to the level of done increases . This of processes efficiency and stability thermodynamics to the laws is based on .

First next , energy of the flow main source as food substances and sun energy show possible . In plants photosynthesis process through sun energy chemical to energy Animal in organisms and this energy food substances through is taken . This processes energy conversion classic is an example .

Biological in systems energy ATP molecule through is stored and is transmitted . When ATP is broken down energy separates and this energy various physiological to processes This process is thermodynamics first to the law complete suitable is coming .

Second law point of view from the point of view than , every how energy in exchange known in quantity energy heat as is lost . This is system entropy to increase take is coming . However alive organisms external environment with energy exchange through this chaos balances .

Table 1: Biological in processes energy exchange efficiency

Process	Incoming energy	Useful energy	Lost energy
Photosynthesis	100%	35%	65%
Breath to take	100%	40%	60%
Muscle contraction	100%	25%	75%

This from the table visible It is clear that biological in systems energy complete useful to work does not rotate . For example , photosynthesis in the process of energy big part heat as is lost . Breath to take in the process and 40 percent of energy useful to work spent , the rest part to the heat turns . Muscle in the activity and efficiency even lower , this organism heat working in the release important role plays .

These results thermodynamics second law confirms , that is energy exchange processes of entropy increase with It's going to happen .

Biological systems again one important feature is this their open system They are external environment with permanent accordingly substance and energy They exchange . This because of they balance from the situation far away , but stable in case there is will be .

Table 2: Energy in exchange metabolic processes

Process	Type	Energy role	Result
Catabolism	Fragmentation	Energy separates	ATP production will be
Anabolism	Synthesis	Energy demand does	Biomolecules harvest will be

Second table biological of processes two main direction shows . Catabolism in the process complicated substances breaks down and energy This energy is released in the form of ATP . is stored . In anabolism and this energy new biomolecules synthesis to do for is used .

Catabolism and anabolism between balance normal functioning of the body for is important . If energy working release and spend between imbalance to the surface if it comes , this to diseases take arrival possible .

Biological in systems energy exchange enzymes using managed . Enzymes reactions speed increases and energy spending This reduces organism energy efficiency increases .

Also , heat exchange is also important importance has . Organism excess the heat out , in balance keeps . This process called thermoregulation.

In general biological in systems energy exchange high at the level ordered , but thermodynamics to the laws complete subordinate This is a process . systems efficiency their to live ability defines .

Conclusion

Conclusion as literally , biological in systems energy exchange alive organisms vital activity provider main process is considered . This processes thermodynamics to the laws subordinate without done increases . First law of energy preservation , second law and energy in exchange of entropy increase represents . Alive organisms open system as external environment with energy exchange , internal stability keeps . Metabolism processes through energy working will be issued and is spent . As a result biological systems high at the level efficient, but energy losses with passing complicated system that is determined .

References

1. Rakhimova, L. A. (2021). IMPROVEMENT OF THE TRAINING PROCESS

FOR PHYSICAL DEPARTMENTS AND ACHIEVEMENT OF EFFICIENCY. *Scientific progress*, *2*(8), 76-81.

2. Зайнолобидинова, С., & Рахимова, Л. (2022). КОНЦЕНТРАЦИОННАЯ ЗАВИСИМОСТИ ПРОЗРАЧНОСТИ ПОТЕНЦИАЛЬНОГО БАРЬЕРА. *Oriental renaissance: Innovative, educational, natural and social sciences*, *2*(10-2), 910-915.
3. Abdurakhimovna, R. L. (2025). CEREBRAL CIRCULATION AND LAWS OF HEMODYNAMICS. In *International Conference on Scientific Research in Natural and Social Sciences* (pp. 313-317).
4. Raximova, L. (2025). TALABALARNING KLINIK QAROR QABUL QILISH KO‘NIKMALARINI SHAKLLANTIRISHDA BIOFIZIK DIAGNOSTIKA TEXNOLOGIYALARINI INTEGRATIV O‘QITISH METODIKASI. *Ижтимоий-гуманитар фанларнинг долзарб муаммолари Актуальные проблемы социально-гуманитарных наук Actual Problems of Humanities and Social Sciences.*, *5*(11s), 458-462.
5. Abdurakhimovna, R. L. (2025). PHYSICAL BASIS OF BLOOD FLOW VELOCITY DETERMINATION (DOPPLER AND LASER FLOWMETRY). *PEDAGOGICAL SCIENCES AND TEACHING METHODS*, 91.
6. Рахимова, Л. А. (2023). РАЗЛИЧНЫЕ КРИТЕРИИ ЭКСПЕРИМЕНТА В ПРЕПОДАВАНИИ ФИЗИКИ. *RESPUBLIKA ILMIY-AMALIY ANJUMANI*, *2*(8), 79-88.
7. Рахимова, Л. (2022). МОДЕЛИ АТОМНОЙ СТРУКТУРЫ ГК (ГК – граница кристаллитов). *JOURNAL OF NEW CENTURY*, *2*(10-2), 911-917.
8. Raximova, L. (2025). NANOTEXNOLOGIYALARDA KVANTLI EFFEKTLARNING EVOLUTSIYASI. *Yoshlarni fizika fani va ta'limi rivojlanishdagi o'rni.*, *6*(12s), 459-465.