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describe how the energy in a system changes and whether the system can perform useful work on its surroundings the first law of thermodynamics applies the conservation of energy principle to systems where heat transfer and doing work are the methods of transferring energy into and out of the system thermodynamics is a very important branch of both physics and chemistry it deals with the study of energy the conversion of energy between different forms and the ability of energy to do work the determination of the relationships among the various properties of materials without knowing their internal structure is the subject of thermodynamics historically thermodynamics was developed before an understanding of the internal structure of matter was achieved what is thermal conductivity opens a modal laws of thermodynamics learn macrostates and microstates the first law of thermodynamics applies the conservation of energy principle to systems where heat and work are the methods of transferring energy into and out of the systems it can also be used to describe how energy transferred by heat is converted and transferred again by work the second law of thermodynamics is a physical law based on universal empirical observation concerning heat and energy interconversions a simple statement of the law is that heat always flows spontaneously from hotter to colder regions of matter or downhill in terms of the temperature gradient heat summary heat energy that is transferred from one body to another as the result of a difference in temperature if two bodies at different temperatures are brought together energy is transferred i e heat flows from the hotter body to the colder the effect of this transfer of energy usually but not james clerk maxwell summary 1 basic concepts and definitions 2 thermodynamic properties 3 ideal and real gasses 4 the first law of thermodynamics for closed systems 5 the first law of thermodynamics for a control volume 6 entropy and the second law of thermodynamics appendix a thermodynamic properties of water appendix b thermodynamic properties of ammonia law of thermodynamics the first law of thermodynamics states that energy can be converted from one form to another with the interaction of heat work and internal energy but it cannot be created nor destroyed under any circumstances mathematically this is represented as Δu q w 1 1 Δ u q w with thermodynamics is a branch of physics which deals with the energy and work of a system it was born in the 19th century as scientists were first discovering how to build and operate steam engines thermodynamics deals only with the large scale response of a system which we can observe and measure in experiments the laws of thermodynamics are important unifying principles of biology these principles govern the chemical processes metabolism in all biological organisms the first law of thermodynamics also known as the law of conservation of energy states that energy can neither be created nor the development of thermodynamics both drove and was driven by atomic theory it also albeit in a subtle manner motivated new directions in probability and statistics see for example the timeline of thermodynamics antiquity the ancients viewed heat as that related to fire the second law of thermodynamics says in simple terms entropy always increases this principle explains for example why you can t unscramble an egg the second law of thermodynamics states thermodynamics is the field of physics that deals with the relationship between heat and other properties such as pressure density temperature etc in a substance specifically thermodynamics focuses largely on how a heat transfer is related to various energy changes within a physical system undergoing a thermodynamic process fundamentals of physics i this course provides a thorough introduction to the principles and methods of physics for students who have good preparation in physics and mathematics emphasis is placed on problem solving 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