Title

This video is about the concept of entropy, which is one of the most important and least understood concepts in physics. It governs everything from molecular collisions to the formation of storms and even the direction of time and the existence of life. The video begins by asking what the Earth gets from the sun, and the answer is energy. The Earth receives a certain amount of energy from the sun every day, and it radiates a smaller amount of energy back into space. This process has remained relatively constant throughout Earth's history to prevent the planet from getting too hot. The video then introduces Sadi Carnot, a 17-year-old student who studied heat engines in an attempt to improve their efficiency. He developed the concept of an ideal heat engine, which is reversible and operates based on temperature differences. Lord Kelvin later used Carnot's work to create an absolute temperature scale, known as the Kelvin scale. The efficiency of an ideal heat engine depends on the temperature difference between the hot and cold sides. However, it is impossible to build a heat engine that is 100% efficient due to energy spreading out and becoming less usable over time, which is described by the second law of thermodynamics. Entropy is introduced as a measure of how spread out or concentrated energy is. The video explains that entropy tends to increase over time, leading to more disorder or randomness in systems. It uses examples of a Rubik's cube and energy packets in metal bars to illustrate this tendency. While it is possible

for heat to flow from cold to hot in rare instances, it becomes increasingly unlikely as the number of atoms in a system increases. Life on Earth is made possible by receiving low entropy energy from the sun, which allows for structures and complexity to exist. The universe started with low entropy after the Big Bang, but over time, matter clumped together due to gravity, increasing entropy. Black holes also contribute to entropy and are believed to have even more entropy than the early universe. The video concludes by discussing the eventual heat death of the universe, where all energy will be spread out and no interesting events will occur. However, the video encourages appreciating and utilizing the low entropy we currently have in order to understand and navigate the world around us. The video is sponsored by Brilliant.org, an online platform for learning math, science, and engineering concepts.