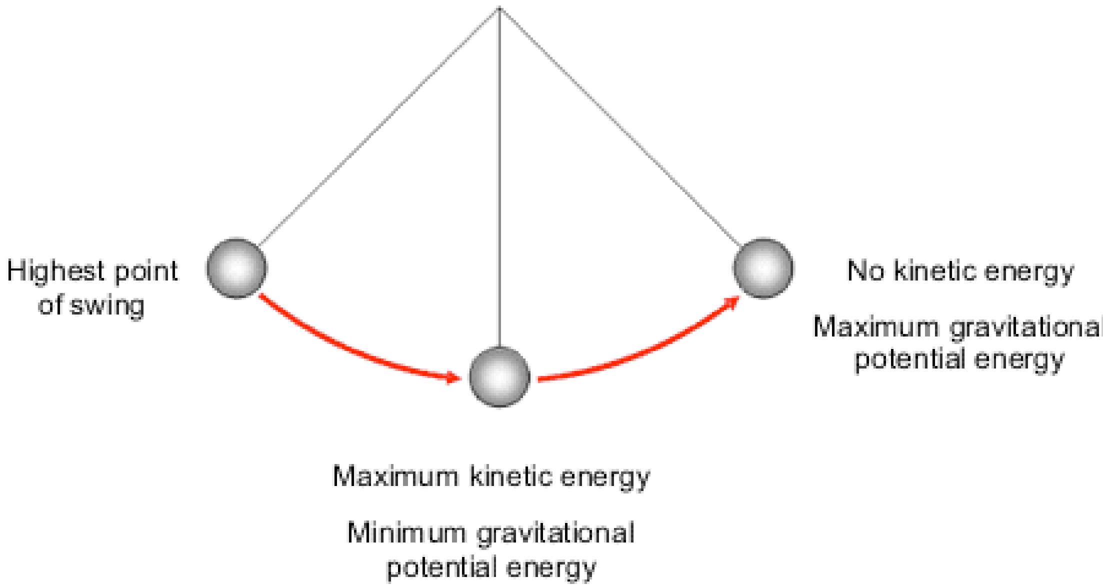
Introduction to Kinetic Energy with the Math!



The kinetic energy of an object is the extra energy which it possesses due to its motion. It is defined as the work needed to accelerate a body of a given mass from rest to its current velocity. Having gained this energy during its acceleration, the body maintains this kinetic energy unless its speed changes. Negative work of the same magnitude would be required to return the body to a state of rest from that velocity.

The adjective "kinetic" to the noun energy has its roots in the Greek word for "motion" (kinesis). The terms kinetic energy and work and their present scientific meanings date back to the mid 19th century. Early understandings of these ideas can be attributed to Gaspard-Gustave Coriolis who in 1829 published the paper titled Du Calcul de l'Effet des Machines outlining the mathematics of kinetic energy.

William Thomson, later Lord Kelvin, is given the credit for coining the term kinetic energy c. 1849.

There are various forms of energy: chemical energy, heat, electromagnetic radiation, potential energy (gravitational, electric, elastic, etc.), nuclear energy, rest energy can be categorized in two main classes: potential energy and kinetic energy.

Kinetic energy can be best understood by examples that demonstrate how it is transformed from other forms of energy and to the other forms. For example a cyclist will use chemical energy that was provided by food to accelerate a bicycle to a chosen speed. This speed can be maintained without further work, except to overcome air-resistance and friction. The energy has been converted into the energy of motion, known as kinetic energy but the process is not completely efficient and heat is also produced within the cyclist.

The kinetic energy in the moving bicycle and the cyclist can be converted to other forms. For example, the cyclist could encounter a hill just high enough to coast up, so that the bicycle comes to a complete halt at the top. The kinetic energy has now largely been converted to gravitational potential energy that can be released by freewheeling down the other side of the hill. (Since the bicycle lost some of its energy to friction, it will never regain all of its speed without further pedaling. Note that the energy is not lost because it has only been converted to another form by friction.) Alternatively the cyclist could connect a dynamo to one of the wheels and also generate some electrical energy on the descent. The bicycle would be traveling more slowly at the bottom of the hill because some of the energy has been diverted into making electrical power. Another possibility would be for the cyclist to apply the brakes, in which case the kinetic energy would be dissipated through friction as heat energy.

Another example is how a roller coaster uses the height of a ramp to obtain extra velocity.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