

5.1a) As the book continues to fall, its potential energy will continue to decrease as its distance to the floor decreases. In contrast, its kinetic energy will increase as its velocity increases.

b) Assuming that the book is not interacting with its surroundings (negating air friction - heat), the total internal energy of the system ( $E_p + E_k$ ) does not change. Therefore, the energy of the system can be found at any point along its path. Given the data in the problem, the energy of the system is 71 Joules. Right before impact, the remaining 47 Joules of potential energy will be converted into kinetic energy. As such, the kinetic energy of the book will be 71 Joules.

c) Since kinetic energy is dependent on mass, a heavier book will have a great kinetic energy at impact.

5.3a) The scale on the left side of the diagram indicated what energy increases from bottom to top. Since reactants are below products, we understand this process, as it proceeds from reactants to products, to increase in internal energy.

b) Since internal energy for this process is increasing, the sign for  $\Delta E$  must be positive.

c) If not work is being done on this system, an increase in energy must result from an endothermic process.

5.4a) iii is the only endothermic process, because heat ( $q$ ) is moving into the system.

b) As none of these process appears to lose more energy than it takes in, none of these processes appears to have a  $-\Delta E$ .

c) All three changes experience a net increase in internal energy

5.13 A object can possess energy as a result of its motion or its position. The former is termed kinetic energy. The later is termed potential energy.

5.14a) As the ball moves higher it decelerate due to gravity. As a result, its kinetic energy decreases.

b) As the ball moves higher its potential energy increases as it moves farther from the “ground.”

5.19a) In thermodynamics, the system refers to the portion of the universe under study.

b) A closed system is a system which can freely transfer energy with the surroundings, but not mass.

c) The part of the universe that is not the system is termed the surroundings.

5.21a) Work is a force applied over a distance. For work to be done there must be resistance to movement.

b) The amount of work done is equal to the magnitude of the force applied times the distance over which it is applied.