Unit 1 - Worksheet 4: Elastic Energy Storage

1. A load of bricks rests on a tightly coiled spring and is then launched into the air. Assume a system that includes the spring, the bricks and the earth. Disregard friction.

y

A

B

First construct a System Schema:

Now represent changes in energy storage using Energy Pie Charts and State Diagrams:

Position A: Position B:

2. A crate is propelled up a hill by a tightly coiled spring. Analyze this situation for a frictionless system that includes the spring, the hill, the crate, and the earth.

y

A

B

0

First construct a System Schema:

Now represent changes in energy storage using Energy Pie Charts and State Diagrams:

Position A: Position B:

3. A bungee jumper falls off the platform and reaches the limit of stretch of the cord. Analyze this situation for a frictionless system that consists of the jumper, the earth, and the cord.

y

A

B

0

y

0

B

First construct a System Schema:

Now represent changes in energy storage using Energy Pie Charts and State Diagrams:

Position A: Position B:

4. In the situation shown, a spring launches a roller coaster cart from rest on a frictionless track into a vertical loop. Assume the system consists of the cart, the earth, the track, and the spring.

A

B

First construct a System Schema:

Now represent changes in energy storage using Energy Pie Charts and State Diagrams:

Position A: Position B:

5. The diagram to the right shows a springy toy for which the “spring” is initially compressed. The toy is released, jumps up from the table, moving quickly away from the table, slowing down on the way up until it stops and then starts speeding up on the way down until it hits the table and stops.

A

B

C

D

E

F

G

The positions shown for the toy represent:

* State A: The toy is at rest, the spring is compressed and being held by the person using it.
* State B: The spring is undistorted and the toy is a few centimeters above the table and on its way up.
* State C: The toy is halfway to its greatest height on the way up.
* State D: The toy has reached its greatest height. It is at rest.
* State E: The toy is halfway to the table on its way down.
* State F: The toy is 1 millimeter above the top of the table on its way down.
* State G: The toy has collided with the table and is at rest on the table.

For the situation shown:

1. Define a (closed) system that is to be analyzed:
2. Complete the T-chart, indicating important changes in the system and the corresponding effects on energy storage in the system.
3. Complete the Energy Pie Chart and State Diagram analysis on the back of this page to depict the energy of the system that corresponds to each of the states shown.

What changes?

Which storage mode?

A B C D E F G