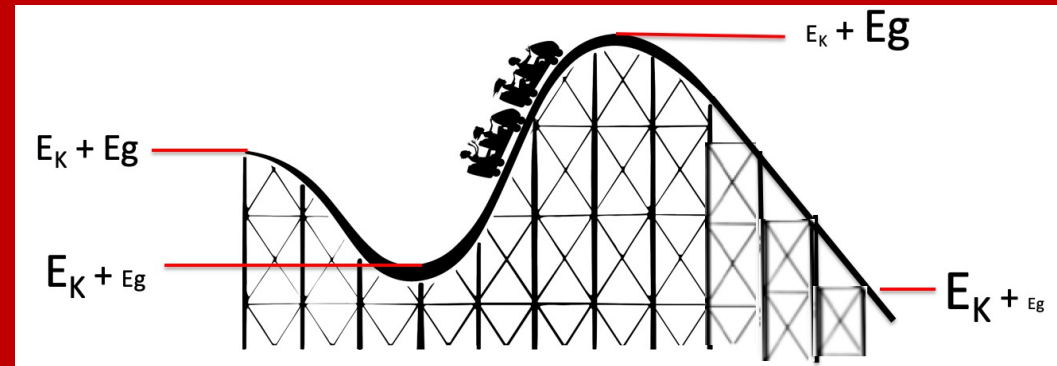


The Law of Conservation of Energy and Efficiency

- The Law of Conservation of Energy
- Total Mechanical Energy
- Conservation of Energy
- Other Forms of Energy
- Energy Efficiency
- Application
- Practice



Preview File

Please enjoy this preview of your Student Version of the presentation. Please note within this sample file:

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- Student versions have portions of the text removed which is given in the teacher version and appear as _____ which the students are to fill in
- Other slides may have on them, this represents writing that has been removed on this sample

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The Law of Conservation of Energy

For an isolated system, _____

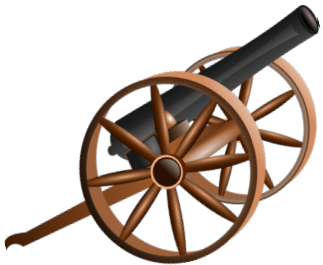
More E_K , Less E_g

Less E_K , Max E_g

Most E_K , Least E_g

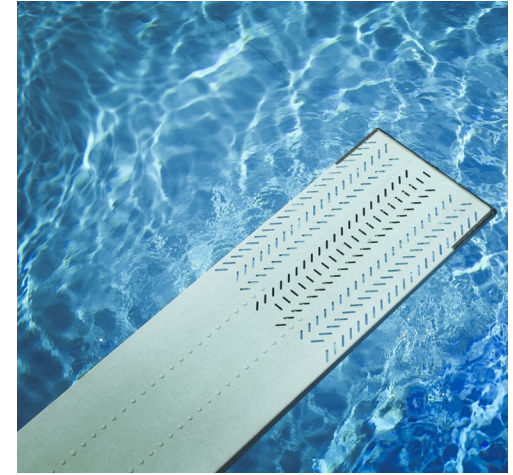
Chemical Energy

Thermal Energy



Example 1

- A 50.0 kg swimmer jumps (from rest) from a 3.00 m diving board under negligible air resistance. At the diving board, the swimmer has zero kinetic energy (no movement) and maximum gravitational potential energy relative to the water surface below. Together, the kinetic energy and gravitational potential energy make up the swimmer's *mechanical energy*.



• _____

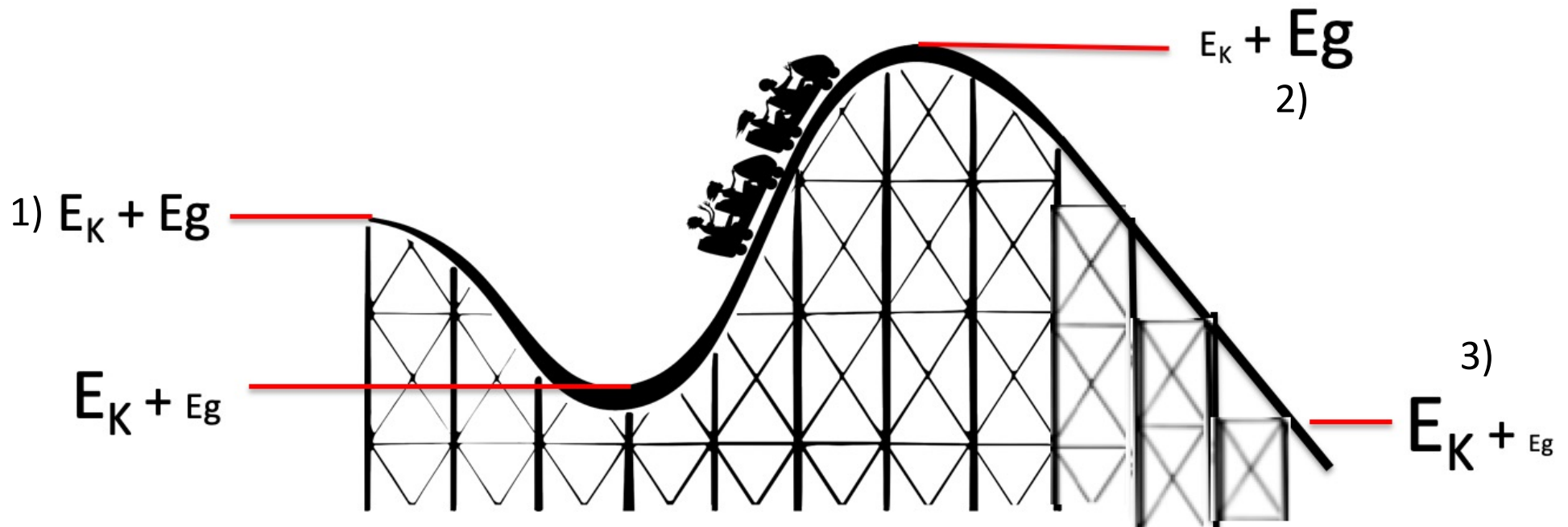
Height (m)	E_g (J)	E_k (J)	Mechanical Energy (J)
3.00	1.47×10^3	0.00	1.47×10^3
2.00	9.80×10^2	4.90×10^2	1.47×10^3
1.00	4.90×10^2	9.80×10^2	1.47×10^3
0.00	0.00	1.47×10^3	1.47×10^3

Total Mechanical Energy

1) _____

2) _____

3) _____



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Check Your Understanding

As the water in a river approaches a 5.7-m vertical drop, its average speed is 5.1 m/s. For each kilogram of water in the river, determine the following:

c) the total mechanical energy at the bottom of the falls

d) the speed at the bottom of the falls

(Recall: $E_{K \text{ (top)}} = 13 \text{ J}$, $E_{g \text{ (top)}} = 55.86 \text{ J}$)

$$E_g = mgh$$

$$E_K = \frac{1}{2}mv^2$$

Check Your Understanding

A basketball player makes a free-throw shot at the basket. The basketball leaves the player's hand at a speed of 7.2 m/s from a height of 2.21 m above the floor. Draw a picture of the scenario then determine the speed of the basketball as it goes through the hoop, 3.05 m above the floor. Note: The direction and therefore the sign (+ or -) doesn't matter as energy is a scalar quantity.

$$E_g = mgh$$
$$E_k = \frac{1}{2}mv^2$$

Other Forms of Energy

- In the last example we simplified things greatly by assuming that 100% of the energy was transferred between E_k and E_g .
- _____
- _____
- Example: Light bulbs only convert a portion of their energy to light, the rest is lost as heat. That is why light bulbs (especially incandescent ones) get so hot!



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Check Your Understanding

A family uses several planks to slide a 350-kg piano onto the back of a pickup truck. The box on the back of the truck is 81 cm above the ground and the planks are 3.0 m long. An average force of magnitude 1500 N is required to slide the piano up the planks.

- a) Determine the work done in loading the piano.
- b) Calculate the efficiency of the planks as a simple machine to load the piano. Note: Work done = Energy in
- c) Where does the rest of the energy go?

Application

- Whether you are talking hockey sticks, baseball bats or pole vaulting poles, aluminum or other composite materials are more efficient compared to wooden ones
- Wooden materials lose more energy due to friction when they twist or bend compared to their hollow, composite cousins (why?)
 - _____
 - _____
- Why do you want to lose less energy? Less energy lost = greater efficiency = more energy directed where it needs to go
 - the ball, the puck or the pole vaulter

