L-9 (M-8) I. Conservation of Energy II. Friction III. Circular Motion

- Kinetic energy, potential energy and conservation of energy
- What is friction and what determines how big it is?
- Friction is what keeps our cars moving
- What keeps us moving in a circular path?
- centripetal vs. centrifugal force





 If the raised object is released, the GPE is converted to KE which can be used to do work



Amusement park physics

- the roller coaster is an excellent example of the conversion of energy from one form into another
- work must first be done in lifting the cars to the top of the first hill.



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- the work is stored as gravitational potential energy
- as the cars fall down the hill, GPE is converted to KE, which then propels the car up the next hill, creating PE.













• It is a common experience that it takes more force to get something moving than to keep it moving.

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Example

- What is the tension in a string used to twirl a 0.3 kg ball at a speed of 2 m/s in a circle of 1 meter radius?
- Force = mass x acceleration [$m \times a_C$]
- acceleration $a_c = v^2 / R = (2 \text{ m/s})^2 / 1 \text{ m}$ = 4 m/s²
- force = m a_{C} = 0.3 \times 4 = 1.2 N
- If the string is not strong enough to handle this tension it will break and the ball goes off in a straight line.



• The centripetal force is provided by the horizontal part, $T_H = mv^2/R$





