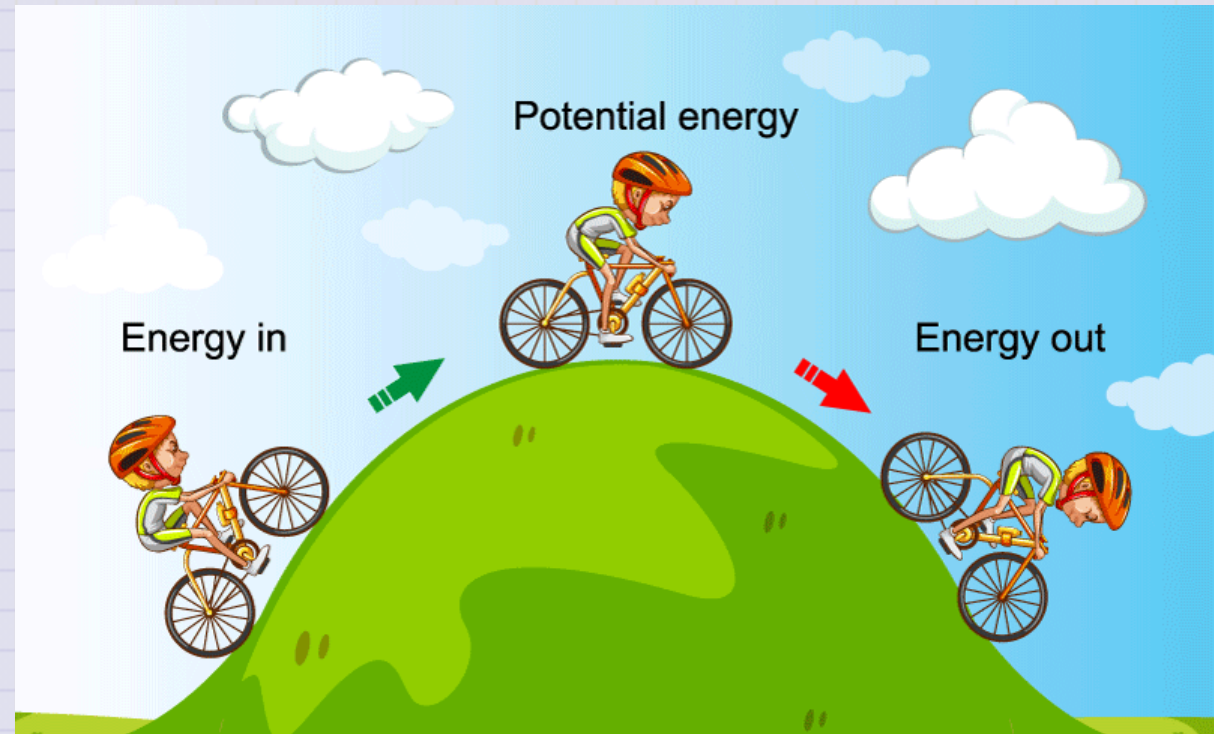# Day 12 - Conservation of Energy

$$\Delta E_{system} = W + Q$$

Announcements

- HW 4 is due next Monday, Feb 17th NOT on Friday the 14th

- There are no office hours on Feb 13th

- Midterm 1 will be available on Monday as well.

Reminder of our Midterm Procedures

- The take-home midterms will be open for almost two weeks; you can often start some exercises early as they cover older material.

- They are meant to be challenging, but we will provide you with the resources and support you need to complete them.

- There is no homework due during the period in which the midterm is assigned.

- In contrast to homework assignments, you must turn in your own solutions to the midterms.

You may work closely together with me, Elisha, and your classmates, but you must write up your own solutions.

Seminars this week

WEDNESDAY, February 12, 2025

- Astronomy Seminar, 1:30 pm, 1400 BPS, Rafael Luque, Univ. of Chicago, Exoplanets

- FRIB Nuclear Science Seminar, 3:30pm., FRIB 1300 Auditorium, Professor Veronica Dexheimer, Kent State University, An overview of the MUSES cyberinfrastructure and what it can do for you

FRIDAY, February 14, 2025

- IReNA Online Seminar, 2:00 pm, FRIB 2025 Nuclear Conference Room,Kelsey Lund, University of California, Berkeley, How The Gentle Winds Beckon: Nucleosynthesis in Neutron Star Merger Remnant Winds

This Week's Goals

- Remind ourselves of the concept of energy and energy conservation

- Apply the conservation of energy to a variety of systems

- Develop the mathematical tools to analyze energy conservation in more complex systems

- Connect our new understanding of energy conservation to our previous work on forces and motion

Clicker Question 12-1

Which of the following are true about a point particle? (Use 1/A - True, 2/B - False)

12-1a. A point particle has no size.

12-1b. A point particle can have no mass.

12-1c. A point particle can have no charge.

12-1d. A point particle can have no internal energy.

Clicker Question 12-2

Einstein's proposed total energy for a particle of mass m moving at speed v is given by $E = \gamma mc^2$, where $\gamma = 1/\sqrt{1 - v^2/c^2}$. We take the limit as $v/c \to 0$ to find the total energy of a particle at rest. Which terms below appear in the Taylor expansion of γ in powers of v/c?

a	b	c	d
1	v/c	$(v/c)^2$	$(v/c)^3$

1.) a only 2.) a and b 3.) a and c

4.) b and d 5.) all terms

Clicker Question 12-3

Which of the following are statements of the conservation of energy?

1. The total energy of a system is constant.

2. $\Delta E_{system} = 0$

3. $\Delta E_{system} = W + Q$

4. $\frac{dE_{system}}{dt} = 0$

5. All of the above