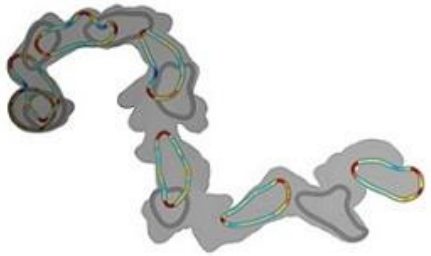
Physics 131- Fundamentals of Physics for Biologists I

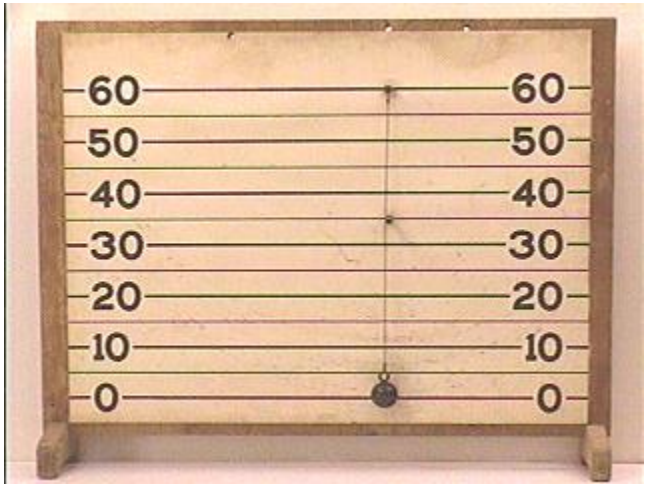


Potential Energy

Power

Forces from Potential Energy

The pendulum starts at position 30 on the left



1. It will go above 30 on the right
2. It will go below 30 on the right
3. **It will reach 30 on the right**

Power

- An interesting question about work and energy is the rate at which energy is changed or work is done. This is called *power.*

$$\text{Power} = \frac{\text{Energy change}}{\text{time to make the change}}$$

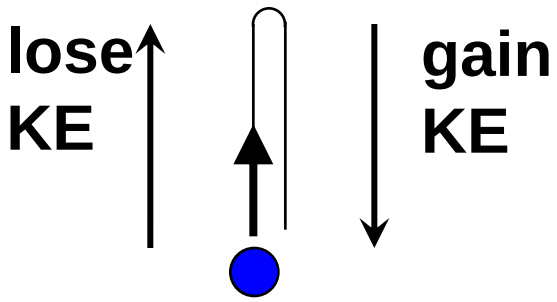
$$= \frac{\Delta W}{\Delta t} = \vec{F}^{net} \cdot \frac{\Delta \vec{r}}{\Delta t} = \vec{F}^{net} \cdot \vec{v} \quad \text{(for mechanical work)}$$

- Unit of power

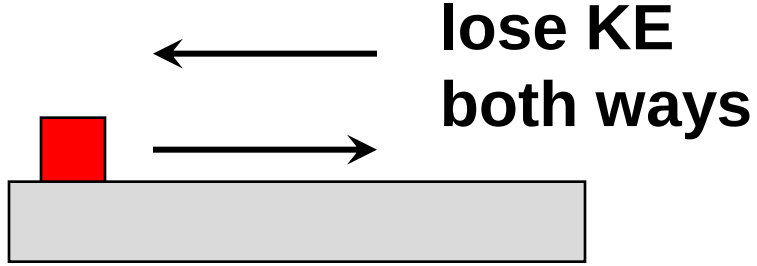
1 Joule/sec = 1 Watt

Conservative forces

- Forces (like gravity or springs) are conservative if when the force takes KE away, you can get it back when you go back to where you started.
- If the kinetic energy that a force takes away can't be restored by going back to where you started it is called non-conservative.
- Compare gravity and friction:



Gravity: Conservative



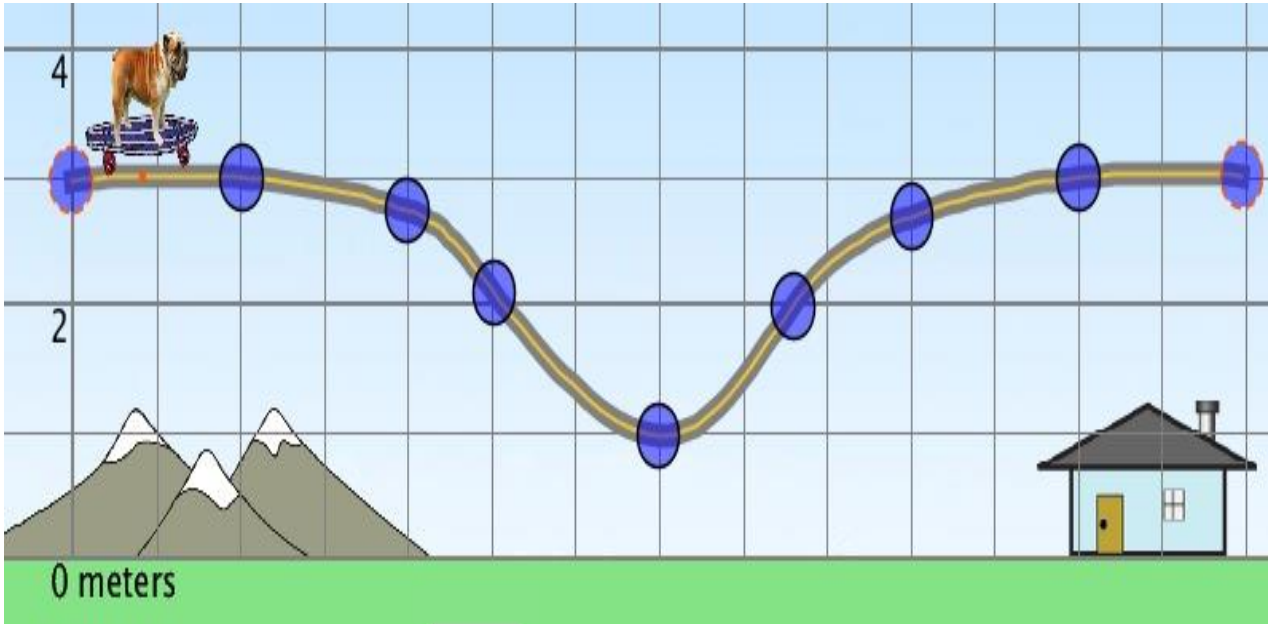
Friction: Non-Conservative

Non-conservative forces/situations

- Friction / drag
  - Three kinds of forces drain Mechanical Energy: friction (indep. of v), viscosity (prop. to v), drag (prop. to v^2)
- Breaking / crushing
  - Normal forces are typically springy and conservative.
  - If an object is deformed too much, the structure can change (break) and drain ME.
- Chemical reactions
  - Chemical structure is another kind of potential energy that can be stored. It can create or drain ME.

A bulldog on a skateboard is moving very slowly when he encounters a 2 m dip. How fast will he be going when he is at the bottom of the dip? The bulldog and skateboard combined have a mass of 20 kg.
Friction and air drag can be ignored.

1. Very slowly
2. About 2 m/s
3. **About 6 m/s**
4. You can't tell from the information given.
5. Other

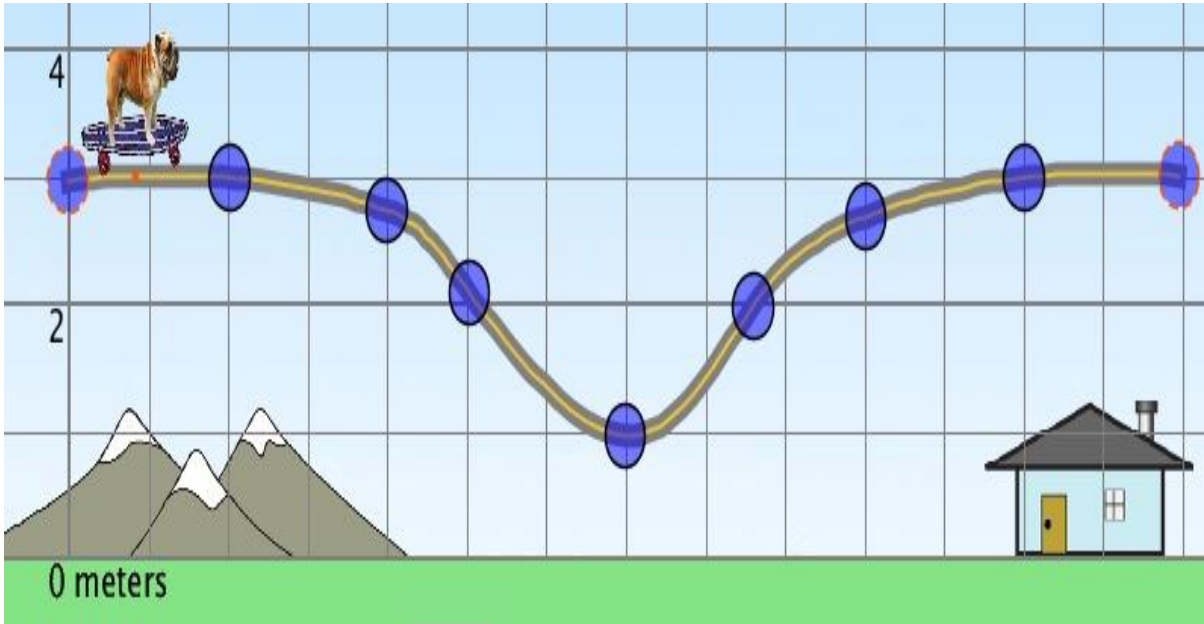


Whiteboard, TA & LA

A bulldog on a skateboard is moving very slowly when he encounters a 2 m dip. The bulldog and skateboard combined have a mass of 20 kg. What is their total mechanical energy?

1. Almost zero
2. About 200 Joules
3. **About 400 Joules**
4. About 600 Joules
5. You can't tell from the information given.
6. Other

Whiteboard, TA & LA



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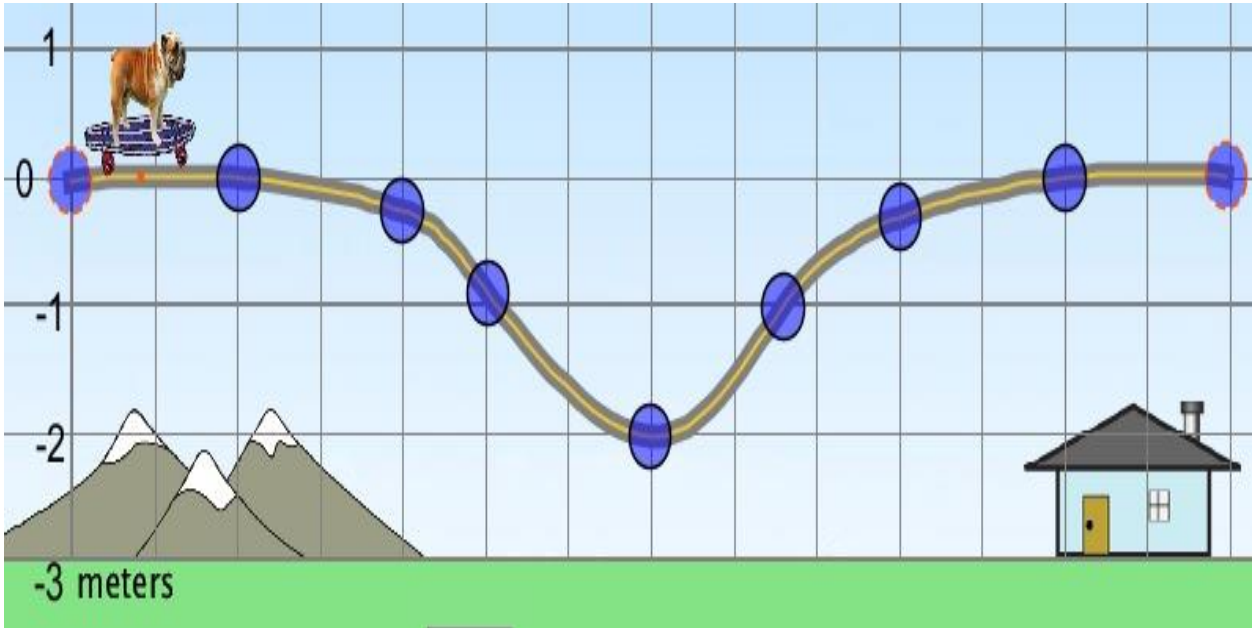
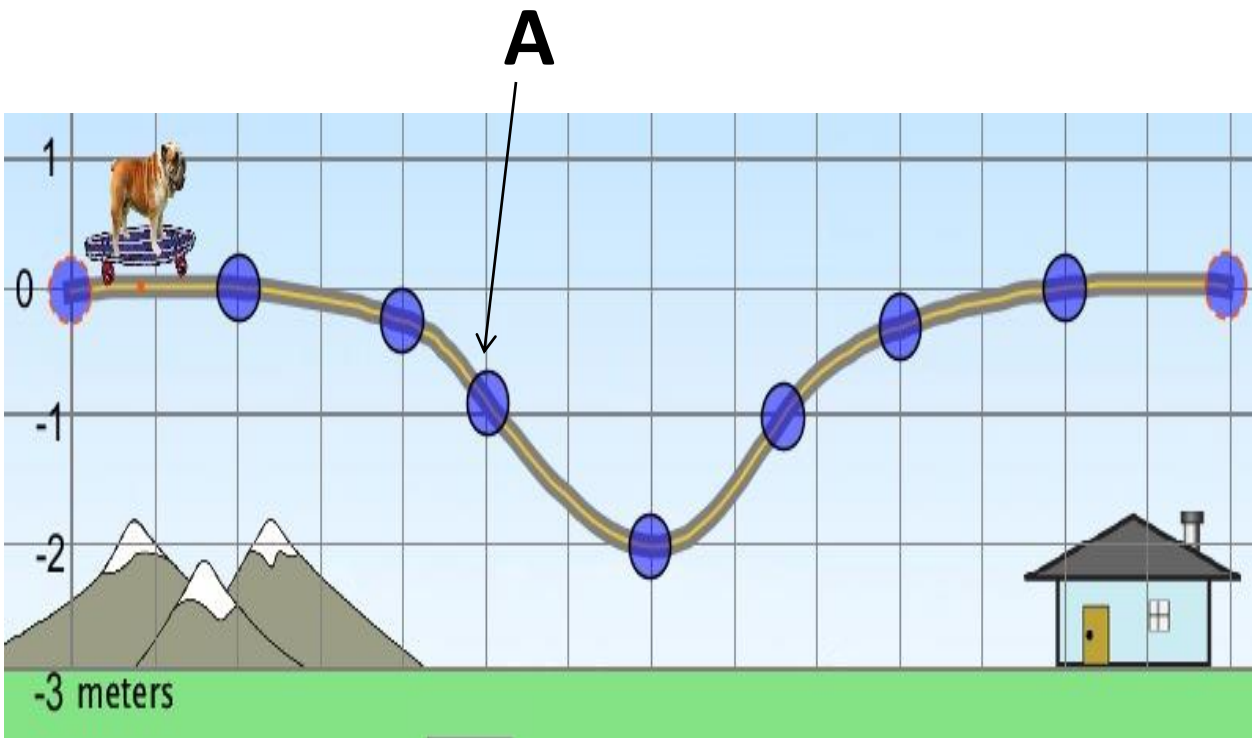


A bulldog on a skateboard is moving very slowly when he encounters a 2 m dip. The bulldog and skateboard combined have a mass of 20 kg.

At point A sketch the direction of the NET force



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