External Work Lifting a Block

Account for the work used to lift and speed up a block

Name _____ Period _____ Date _____

Compare applied work, gravitational potential energy change, and kinetic energy change during an upward displacement.

About 20 to 25 minutes | buildphysics.com/?experiment=external-work-lift

Predict the energy changes

Set Block mass to 2.0 kg, Upward applied force to 24.0 N, and Initial vertical velocity to 0 m/s. Use g = 9.8 m/s². Read the initial center y in Properties → Live values. The target is a rise of 2.0 m.

Initial y _____ m Target y _____ m

$$W = F\Delta y \quad \Delta U_g = mg\Delta y \quad K = \tfrac{1}{2}mv^2 \quad W_{net} = \Delta K$$

1. Calculate the work done by the upward force, the work done by gravity, and the change in gravitational potential energy for the 2.0 m rise.

2. Calculate the change in kinetic energy and the final speed. Show how the work is shared between increasing height and increasing speed.

Run to the target height

Run slowly near the target y. Use Step to reach it closely. Read the actual center y and speed in Live values. If needed, use the actual rise in your comparison.

Actual rise (m)	Predicted speed (m/s)	Measured speed (m/s)

Account for the work

3. Use your measured speed and rise to calculate the kinetic and potential energy changes. Compare their sum with the applied work. Explain why applied work is different from net work.

Lift at constant speed

Reset. Set Initial vertical velocity to +2.0 m/s. Choose an upward force that balances the block's weight.

4. Record your chosen force. For another 2.0 m rise, predict the applied work, potential energy change, kinetic energy change, and final speed.

Test your prediction. Read the speed near the target height.

Chosen force (N)	Initial speed (m/s)	Final speed (m/s)
	+2.0	

5. Explain how the upward force can do positive work while the block's kinetic energy stays constant. Include gravity's work in your explanation.