

11.13. (a) Push a puck with force F across a frictionless level surface. With the puck as the system, $W_{\text{ext}} = F\Delta x = \Delta K$. The gravitational potential energy does not change because $\Delta y = 0$. Since the surface is frictionless, $\Delta E_{\text{th}} = 0$.

(b) Push a box across a rough level surface at constant speed. The system is the box. Again, $\Delta y = 0$, but now $\Delta K = 0$, and friction dissipates the external work done by the push as thermal energy.