

3 Conservation of energy and power — Part 2 — Answers

Answers

Work through these after you have tried the questions yourself.

2.1 $mgh = \frac{1}{2}mv^2 \Rightarrow v = \sqrt{2gh} = \sqrt{2 \times 9.8 \times 1.8} = 5.9 \text{ m/s}.$

2.2 gravitational potential energy is converted into kinetic energy (it speeds up as it drops).

2.3 $P = \frac{W}{\Delta t} = \frac{6000}{4.0} = 1500 \text{ W}.$

2.4 efficiency = $\frac{300}{500} = 0.60 = 60\%.$

2.5 energy at bottom = $mgh - 15 = 1.0 \times 9.8 \times 2.0 - 15 = 19.6 - 15 = 4.6 \text{ J} = \frac{1}{2} \times 1.0 \times v^2$, so $v^2 = 9.2$ and $v = 3.0 \text{ m/s}.$

2.6 it must do work against friction and air resistance, which constantly remove energy as heat; the fuel replaces that energy even though the forces are balanced.