

54. Using Eq. 7-48 and Eq. 27-22, the rate of change of mechanical energy of the piston-Earth system, mgv , must be equal to the rate at which heat is generated from the coil: $mgv = i^2 R$. Thus

$$v = \frac{i^2 R}{mg} = \frac{(0.240 \text{ A})^2 (550 \Omega)}{(12 \text{ kg}) (9.8 \text{ m/s}^2)} = 0.27 \text{ m/s} .$$