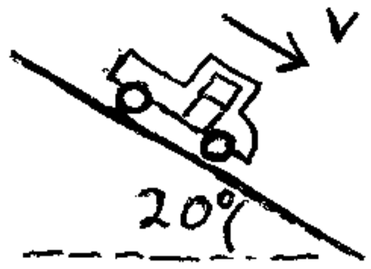
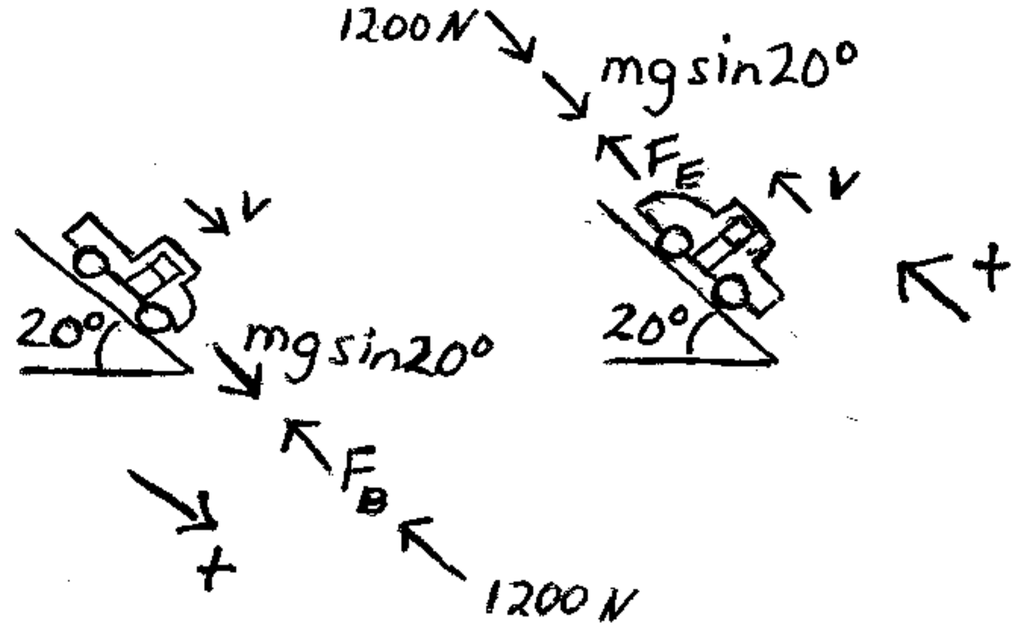
Oct. 29, 2020

This is a problem involving work and energy.



A truck is going down a hill that has an inclination of 20°. If the truck is travelling at constant speed v, what is the power dissipated by the brakes? If the truck then travels up the hill at constant speed v, what is the power produced by the engine? The mass of the truck is 6,000 kg, and the resistance force acting on the truck is 1200 N.

Solution:



Apply Newton's second law when the truck goes down the incline: $mg\sin 20° - F_B - 1200 = ma = 0$, since $a = 0$.

Solve: $F_B = mg\sin 20° - 1200 \Rightarrow F_B = 6000(9.8)\sin 20° - 1200$
$= 18911$ N

Power dissipated by brakes $= F_B v = 18911v$ Watts (answer)

Apply Newton's second law when the truck goes up the incline: $F_E - 1200 - mg\sin 20° = 0$, $F_E = 21311$ N

Power produced by engine $= F_E v = 21311v$ Watts (answer)