Answer on Question #54176-Physics-Mechanics-Kinematics-Dynamics

A recovery vehicle is towing a broken down lorry, of mass 42 tonne, up an incline of 1 in 10. Both vehicles start from rest and accelerate constantly up the incline at 0.1m/s2. If the resistance to motion (not the gravitational component) is:-

F = 820 + 0.06V3 where F is resistance in Newtons and V is velocity in m/s. What is power in kW transmitted through the tow hook to the lorry at a velocity of 10m/s?

A. 462.82 B. 556.34 C. 67.65 D. 120.8 E. 1220.67

Solution

Power in kW transmitted through the tow hook to the lorry is

$$P = \overrightarrow{F_{tot}} \cdot \vec{v} = (ma + mg\sin\alpha + F)v.$$

$$P = (ma + mg\sin\alpha + 820 + 0.06\mathrm{v}^3)v.$$

$$P = (42000 \cdot 0.1 + 42000 \cdot 9.8\sin(\tan^{-1}0.1) + 820 + 0.06 \cdot 10^3)10 = 462.82\ \mathrm{kW}.$$

Answer: A. 462.82.