

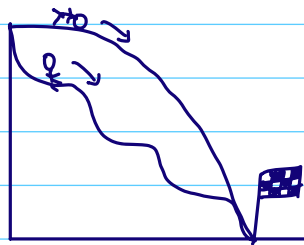
Jan 9

Conservation of Energy

Total energy in any closed system (not affected by external forces) is **CONSTANT** (remains the same)

$$\sum E_i = \sum E_f$$

Ex 6-10 Two water slides



Who is faster at the bottom? **same speed**
Who gets to the finish first? **bottom converts E_p first**
always have more E_k

L and H of each slide is the same

Power: rate at which work is done

$$P = \frac{W}{t} \quad \text{Watts (J/s)} \quad 1 \text{ hp} = 746 \text{ W}$$

$$P = \frac{Fd}{t} \rightarrow P = Fv$$

Efficiency

$$e = \frac{W_{out}}{W_{in}} = \frac{P_{out}}{P_{in}} = \frac{E_{out}}{E_{in}}$$

Ex ② A crane is driven by a motor providing power to lift 350 kg at 8 m/s. It lifts 300 kg through 25 m in 5.0 s. Find the efficiency

$$P_{in} = (350 \times 9.8)(8) = 27,440 \text{ W}$$

$$\rightarrow P_{out} = (300 \times 9.8)\left(\frac{25}{5}\right) = 14,700 \text{ W}$$

Useful work

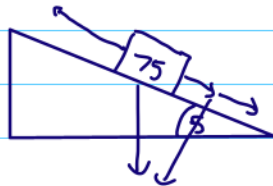
$$e = \frac{14700}{27440} = 54\%$$

Assignment point p.62 # 29-41 odd

Jan 11 Ex ① A bicyclist coasts down a 5° hill at 10 m/s.

The total mass of system is 75 kg

Find the power needed to cycle up the same hill at the same speed.



$$\begin{aligned} F_{g\parallel} &= Mg \sin \theta \\ &= (75)(9.8)(\sin 5) \\ &= 64.06 \text{ N} \end{aligned}$$

$$\begin{aligned} P &= Fv \\ &= (2)(64.06)(10) \\ &= 1281.2 \text{ W} \end{aligned}$$

