Physics 11
Thursday April 25th

Work = Fd

Power = $\frac{\text{work}}{\text{time}}$

Work = $\Delta KE = KE_2 - KE_1$

$KE = \frac{1}{2}mv^2$ ⟶ dependent on speed

$PE = mgh$ ⟶ dependent on height

$TE = KE + PE$

Conservation of energy → TE remains constant in a system.

Power is measured in Watts.

1 W is equal to 1 J/s

Energy is measured in J

Example: How much energy is used by a 60 W lightbulb that is turned on for 1.0 min?

$60\ W = 60\ J/s$

$1\ min = 60\ sec$

$Energy = 60\ J/s \times 60\ sec$

$= 3600\ J$

Efficiency

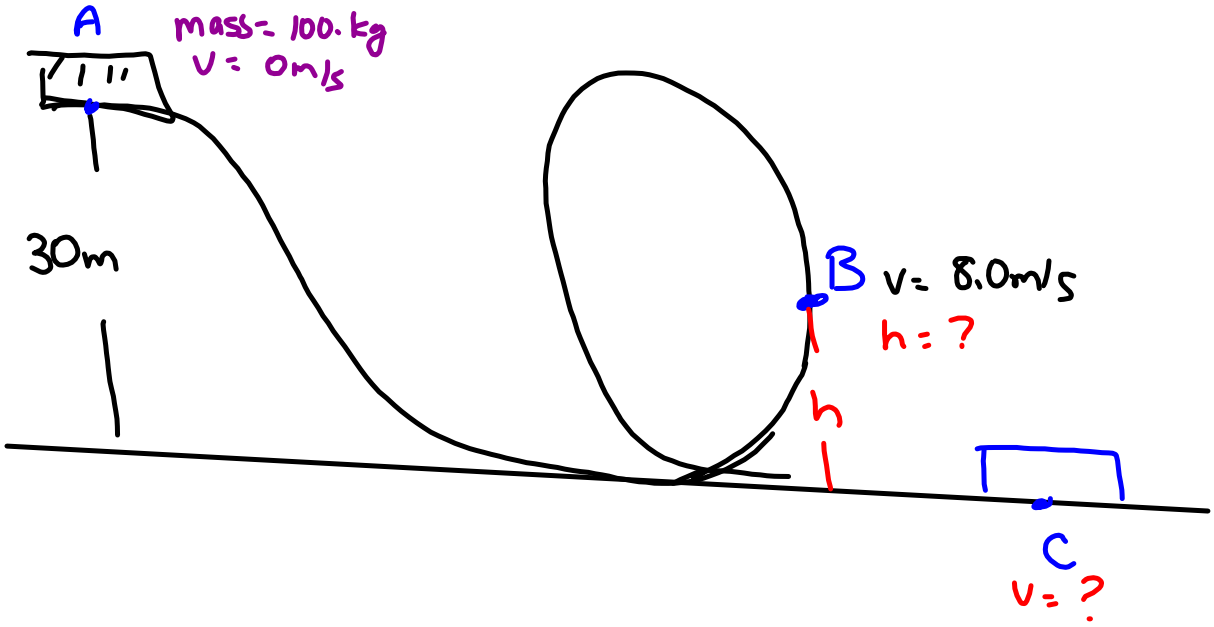
$$\frac{\text{Work output}}{\text{Work input}} \times 100\% \quad \text{"or"} \quad \frac{\text{Energy Output}}{\text{Energy input}} \times 1 \text{ or } 1$$

A microwave oven transforms 345 Joules of radiant energy into 301 Joules of thermal energy in some foods. Calculate the efficiency of the transformation

$$\text{eff} = \frac{\text{Energy output}}{\text{Energy input}} \times 100\% = \frac{301\ \text{J}}{345\ \text{J}} \times 100\%$$

$$= 0.872 \times 100\%$$

$$= 87.2\%$$


A
mass = 100. kg
v = 0 m/s
30m
B
v = 8.0 m/s
h = ?
h
C
v = ?

Point A

$PE = mgh$

$= 100(9.81)30$

$= 29\,430\ J$

$KE = 0\ J \quad (v = 0\ m/s)$

$TE = 29\,430\ J$ → Everywhere along the path of the rollercoaster.!

Point B

$TE = 29430\ J$

$KE = \frac{1}{2}mv^2$

$= \frac{1}{2}(100)(8)^2$

$KE = 3200\ J$

$PE = TE - KE$

$= 29430 - 3200$

$PE = 26230\ J$

$PE = mgh$

$26230 = 100(981)h$

$26.7\ m = h_B$

Point C

TE: 29430 J
PE: 0 J (no height)

KE: TE - PE
= 29430 - 0
KE = 29430 J

$KE = \frac{1}{2} m v^2$

$29430 = \frac{1}{2}(100)v^2$

$24\ m/s = v$

Homework

p 266 (41)
270 (44a, 46)
277 (37 a,b)
287 (1, 2, 3)