POWER

POWER = The **RATE** at which **Work** is done.

So **work** divided by time is **power**.

$$P = \frac{W}{t}$$

The Unit is **Joules/Second**

This has been named the **watt, (for James Watt)** and has the abbreviation **W.**

1 kilowatt (kW) = 1000 Watts

1 horsepower (hp) = 746 Watts

POWER

Remember: W = Fd

$$P = \frac{Fd}{t} = \frac{F\,d}{t} = F\,v$$

During Acceleration, ΣW = ΔKE:

$$P = \frac{\Sigma W}{t} = \frac{\Delta KE}{t} = \frac{\frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2}{t}$$

POWER

If an Object is moving Vertically,
POWER = The **Time Rate** at which **PE_G is changing:**

$$P = \frac{\Delta PE_G}{t} = \frac{mgh}{t} = \frac{mgh}{t} = mg\,v$$

POWER

If an Object is moving against Friction on a Level Surface, POWER to overcome Friction:

$$P = \frac{W_{FR}}{t} = \frac{mg\,\mu\,d}{t} = \frac{mg\,\mu\,d}{t} = mg\mu\,v$$

If an Object is moving against Friction on an Incline, POWER to overcome Friction:

$$P = \frac{W_{FR}}{t} = \frac{mg\,\mu\,d\cos\theta}{t} = \frac{mg\,\mu\,d\cos\theta}{t} = mg\mu\,v\cos\theta$$

POWER

A 2000 kg car starts from rest and accelerates to a final speed of 25 m/s in 15 seconds. What was the power output of the car?

P = W/t = ΔKE / t

$P = (1/2\, mv_f^2 - 1/2\, mv_i^2) / t$

P = [½ 2000kg(25 m/s)^2 - ½ 2000kg(0 m/s)^2] / 15 sec

P = <u>41,667 watts</u>

POWER

A 30 kg gazelle uses 900 watts to jump up 8 meters. What was its speed?

P = mgv

900 watts = (30 kg)(9.8 m/s^2)v

<u>3.06 m/s</u> = v