Alvl P1: work, energy and power (ch6) Cheat Sheet

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Work Done and Energy

Work done is **maximum** when cos0 = 0 (the force and distance travelled are therefore parallel)

Work done is **minimum** when cos0 = 90 (the force and distance travelled are therefore perpendicular)

types of energy:

- kinetic energy
- potential energy
- thermal energy (not covered in this spec point)

for example:

a ball held at a height will have Ep, when dropped and landing on the ground (assuming there is no energy loss) all the energy will be converted into Ek.

Δ E = W --> change in energy in a system = work done on a system

Derrivations

Gravitational Potential Energy:

ΔE = W

ΔE = Fxcos0

(work done is force x distance x angle)

where F = ma (in this case a is g)

and distance is hieght travelled

ΔE = mghcos0

as cos0 where 0 is 0' cos0 = 1 so

ΔE = mgh

Kinetic Energy:

ΔE = W

ΔE = Fxcos0

(work done is force x distance x angle)

ΔE = Fs

(cos0 = 1)

ΔE = mas

as $v^2 = u^2 + 2as$

rearrange where u = 0

as = $v^2/2$

therefore

ΔE = 1/2 mv^2

Definitions

Work done	product of the force and the distance moved in this direction
power	rate of work done
	rate of energy transferred

Equations

Work done	Fxcos0 ---(where x is distance and 0 is theta between f and x)
change in energy	ΔE = W
power	W/t
	Fx/t
	Fv
efficiency	useful/total (x100)

Conversion of energy

example of findign resistive forces going down hill

--top | v=0

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--bottom | v=8

a ball is roll down from the top to the bottom

-length of the ramp is 7m

-height is 5m

as ΔE = W

energy at top (Ep no Ek) then energy at bottom (Ek no Ep)

from this we know it is all transferred (assuming no loss to heat)

therefore

ΔE = mgh - 1/2mv^2

mgh - 1/2mv^2 = Fx

(where x is length of ramp)

then just put in numbers to solve for F