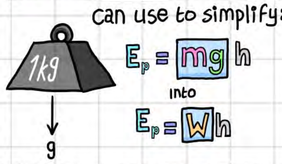
equatational Perambulations desireth by ye Olde boarde of inquisition for the apprentices of the physiks

1 W = mg

W = Weight	Newtons	N
m = mass	Kilograms	kg
g = gravitational field strength	Newtons/kilogram	N/kg

can use to simplify:



$E_p = mgh$ into $E_p = Wh$

2 W = Fd

W = Work done	Joules	J
F = Force	Newtons	N
d = distance (along the line of action)	metres	m

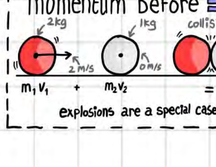
Force usually weight

distance usually height

for stairs only use height

3 F = ke

F = Force	Newtons	N
k = Spring Constant (a fixed value which changes for different materials)	Newtons per metre	N/m
e = extension	metres	m



The spring can be replaced by any object that stretches (e.g. elastic band)

4 d = St

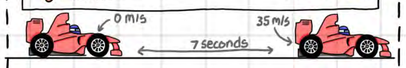
d = distance travelled	metres	m
S = Speed	metres per second	m/s
t = Time	Seconds	s

If speed is not constant this calculates average speed.

5 a = Δv ÷ t

this means change

a = acceleration	metres per second^2	m/s^2
Δv = change in velocity	metres per second	m/s
t = time	seconds	s



change in velocity (Δv) is calculated as final velocity − initial velocity

6 F = ma

F = force	Newtons	N
m = mass	Kilograms	kg
a = acceleration	metres per second^2	m/s^2

Higher tier

Inertial mass = force ÷ acceleration

big things are hard to push

Falling objects accelerate at 9.8 m/s^2 (look familiar?)

7 p = mv

p = momentum	kilogram metres per second	kg m/s
m = mass	Kilograms	kg
v = velocity	metres per second	m/s

Conservation of momentum

momentum before = momentum after

explosions are a special case with zero momentum

8 $E_K = \frac{1}{2}mv^2$

E_K = Kinetic energy	Joules	J
m = mass	Kilograms	kg
v = Velocity	metres per second	m/s

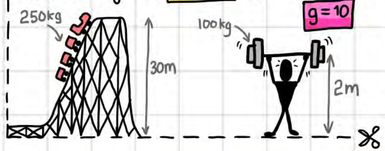
use this equation with moving objects

9 $E_p = mgh$

remember mg = W

E_p = gravitational potential energy	Joules	J
m = mass	Kilograms	kg
g = gravitational field strength	Newtons/Kilogram	N/kg
h = height	metres	h

use for objects raised against gravity



10 P = E ÷ t

P = Power	Watts	W
E = Energy transferred	Joules	J
t = Time	Seconds	t

Use to calculate the rate of energy transfer

11 P = W ÷ t

P = Power	Watts	W
W = Work	Joules	J
t = Time	Seconds	t

Use to calculate the rate of work

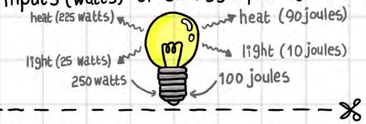
increasing the rate of work increases the power

12 13 E = U ÷ T × 100

multiply by 100 to calculate percentage efficiency

E = efficiency	no units	
U = useful output	Joules J or Watts W	
T = total input	Joules J or Watts W	

efficiency can be calculated using power inputs (watts) or energy inputs (joules)

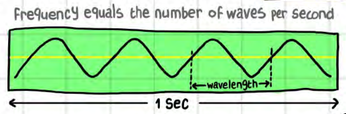


14 v = fλ

v = velocity	metres per second	m/s
f = frequency	hertz	Hz
λ = Wavelength (pronounced "lambda")	metres	m

the wave equation applies to all waves

Frequency equals the number of waves per second



15 Q = It

Q = Charge	Coulomb	C
I = Current	Amps	A
t = time	Seconds	s

Use this equation to calculate the charge that has flowed.

16 V = IR

V = Potential difference	Volts	V
I = Current	Amps	A
R = Resistance	Ohms	Ω

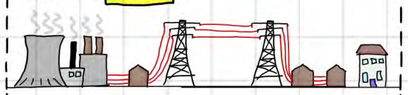
Use this formula to calculate volts, amps or ohms. You will have 2 known and 1 unknown value I=V÷R R=V÷I

NRG NRG NRG NRG

17 P = VI

P = Power	Watts	W
V = Potential difference	Volts	V
I = Current	Amps	A

Use to calculate power when you are given the voltage



18 P = V I = I R

replace V with IR

P = IRI – pirf chicken

$P = I^2R$

Use this Power equation when no voltage is given.

19 E = Pt

E = Energy transferred	Joules	J
P = Power	Watts	W
t = Time	Seconds	t

Use this equation to switch between power ⇌ energy

This is a rearranged version of P = E ÷ t

20 E = QV

E = Energy transferred	Joules	J
Q = Charge	Coulomb	C
V = Potential difference	Volts	V

Use this equation to calculate the energy transferred per charge flowed

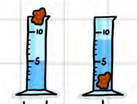
V = E ÷ Q

a useful definition of voltage

21 ρ = m ÷ V

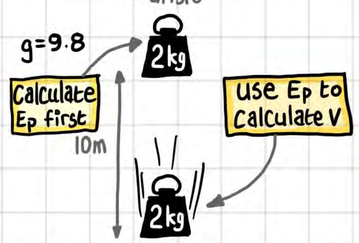
the symbol of density is "rho"

ρ = density	kilograms per metres^3	kg/m^3
m = mass	kilograms	kg
V = volume	metres^3	m^3



mgh = ½mv²

energy up is transferred energy down



½ke² = ½mv²

elastic energy is transferred kinetic energy

Use Ee to Calculate m or V

assume all Ee is transferred to Ek