Energy

Equations to Learn

kinetic energy $= \frac{1}{2} \times$ mass $\times$ speed^2	$E_K = \frac{1}{2}mv^2$
GPE = mass × gravitational field strength × he	$E_P = mgh$
power $= \frac{\text{work done}}{\text{time taken}} = \frac{\text{energy transferred}}{\text{time taken}}$	$P = \frac{W}{t} = \frac{E}{t}$
efficiency $= \frac{\text{useful energy output}}{\text{total energy input}}$ efficiency $= \frac{\text{useful power output}}{\text{total power input}}$	
elastic potential energy $= 0.5 \times$ spring consta (extension)^2	$E_e = \frac{1}{2}ke^2$
change in thermal energy = mass × specific heat capacity × temperature cha	$\Delta E = mc\Delta\theta$

Particle Model of Matter

Equations to Learn

density = $\frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$
Pressure in liquids: density of liquid x Gravitational field strength x depth	P = ρ g h
change in thermal energy = mass × specific heat capacity × temperature change	$\Delta E = mc\Delta\theta$
thermal energy for a change in state = mass × specific latent heat	$E = mL$
for a gas: pressure × volume / Temperature = constant	$\frac{PV}{T} = constant$

Forces

Equations to Learn

weight = mass × gravitational field strength	$W = m\,g$
work done = force × distance (moved along the line of action of the force)	$W = Fs$
Elastic force = spring constant × extension	$F = ke$
moment of a force = force × distance (perpendicular to the direction of the force)	$M = Fd$
pressure = $\frac{\text{force normal to a surface}}{\text{area of that surface}}$	$p = \frac{F}{A}$
distance travelled = speed × time (if v constant)	$s = vt$
acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$ $= \frac{\text{final velocity-initial velocity}}{\text{time taken}}$	$a = \frac{\Delta v}{t}$ $= \frac{v-u}{t}$
resultant force = mass × acceleration	$F = ma$
Displacement for an accelerated motion	$s = ut + \frac{1}{2}at^2$
Alternative equation for displacement	$s = \frac{(u+v)t}{2}$
Pressure = height of column × density of liquid × gravitational field strength	$p = h\,\rho\,g$
(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2as$

Waves

Equations to Learn

wave speed = frequency × wavelength	$v = f\,\lambda$
time period $= \frac{1}{\text{frequency}}$	$T = \frac{1}{f}$
magnification $= \frac{\text{image height}}{\text{object height}}$	$M = \frac{h_{image}}{h_{object}}$
Snell's law for refraction	$n_1 \sin(i) = n_2 \sin(r)$

Electricity

Equations to Learn

charge flow = current × time	$Q = I\,t$
potential difference = current × resistance	$V = I\,R$
total resistance in series = resistance of component 1 +resistance of component 2	$R_T = R_1 + R_2$
total resistance in parallel	$R_T = \frac{R_1 x R_2}{R_1 + R_2}$
Resistance of a wire of length l, cross sectional area A and resistivity ρ	$R = \frac{\rho\,l}{A}$
power = current × potential difference	$P = I\,V$
power = (current)^2 × resistance	$P = I^2R$
energy transferred = power × time	$E = Pt$
energy transferred = charge flow × potential difference	$E = QV$

Magnetism and Electromagnetism

Equations to learn

Force = magnetic flux density × current × length of conductor in magnetic field	$F = BIl$
$\frac{\text{potential difference across primary coil}}{\text{potential difference across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$	$\frac{V_P}{V_S} = \frac{N_P}{N_S}$
p.d across primary × current in primary = p.d. across secondary x current in secondary	$V_P I_P = V_S I_S$

Atomic physics and radioactivity

There are no equations in this section of the course