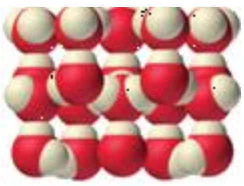
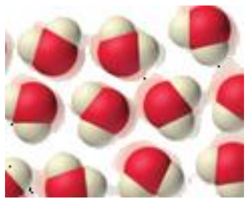
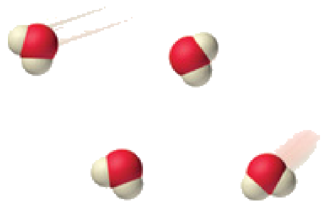
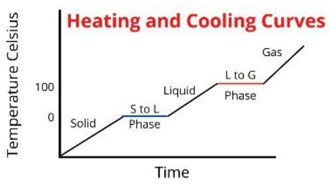
Energy can neither be created or destroyed, only transformed from one form to another or transferred from one object to another	Kinetic energy, gravitational potential energy, elastic potential energy, thermal energy, chemical energy	Energy is the ability to do work. Joules, J	Energy an object has when it is moving e.g. moving car, rolling ball, a person running. It depends on the mass of the object and the square of its speed
Law of conservation of energy	Forms of energy	Energy definition and units	Kinetic energy
Energy stored in an object due to it being a height (in m) above ground e.g. a book on a shelf, a roller coaster at the top of the ride	Energy stored in an object due to it being stretched / compressed e.g. a stretched rubber band, a compressed spring in a toy, a drawn back bow	Energy stored in an object due to the number of particles in the object and their temperature e.g. body heat, a hot cup of coffee, the Sun warming your skin	Energy that is caused by the transfer of thermal energy. Transfer is by conduction, convection & radiation
Gravitational potential energy	Elastic potential energy	Thermal energy	Heat
Energy of moving electric charges (electrons) E.g. battery powering a phone, lightening, electrons flowing through household wires	Stored electrical energy (electrons = charge) e.g. a charged battery not in use, static electricity before it discharges	Energy from vibrations in air or other mediums (water) e.g. noise produced by a car engine or an airplane, air conditioning or fridge humming	Visible energy that travels in waves e.g. sunlight, a torch beam
Electrical energy	Electrical potential energy	Sound energy (as waste form)	Light energy
Energy stored in the chemical bonds of substances e.g. food being metabolised by the body, fuel being burned in a car, a battery powering a torch	This is about *how good* something is at using energy WITHOUT wasting it	How much useful energy is gained compared to how much energy was put into the system	Efficiency (%) = $\frac{\text{useful energy output}}{\text{energy input}} \times 100$
Chemical (potential) energy	Efficiency	Efficiency equation	Efficiency equation

Particles – tightly packed, fixed position Movement – vibrate only Shape & volume – both fixed	Particles – close together, no fixed position Movement – move around each other Shape & volume – take shape of container, fixed volume	Particles – far apart Movement – move freely in all directions Shape & volume – fills entire container, changes volume and shape	Amount of energy to weaken (S → L, melting) or strengthen bonds (L → S, freezing) <u>without a change in temperature</u>
States of matter - solid	States of matter - liquid	States of matter - gas	Latent heat of fusion
			Amount of energy to change the state (L → G), without a change in temperature; occurs at the boiling point of the substance
Ice	Water	Water vapour	Latent heat of vaporisation
Amount of heat energy needed to change the temperature of 1 kg of the substance by 1°C. (The higher the SHC the more energy is needed to change the temp. of the substance).		ΔE = energy transferred (J) P = power (W, which is joules per second) t = time (s)	Ek = kinetic energy (J) m = mass of the object (kg) v = speed (ms^{-1})
Specific heat capacity	Heating curve (for water)	$\Delta E = Pt$	$E_k = \frac{1}{2} mv^2$
Ep = gravitational potential energy (J) m = mass (kg) g = gravitational field strength (on Earth, 10 N/kg Δh = change in height (m)	W = work done (J) F = force applied (N) d = distance moved in the direction of the force (m)	E(thermal) = energy gained or lost (J) M = mass of the substance (kg) c = specific heat capacity (J/(kg·°C) ΔT = change in temperature (°C)	E(thermal) = energy transferred (J) m = mass of the substance (kg) L = latent heat (J/kg)
$E_p = mg\Delta h$	$W = Fd$	$E\ (thermal) = mc\Delta T$	$E\ (thermal) = mL$

Kinetic energy J	$Ek = \frac{1}{2}mv^2$	m = mass (kg) v = speed (ms^{-1})	Energy due to motion. Example: 2 kg object moving at 3 ms^{-1} Ek = 9 J
Gravitational potential energy J	$Ep = mg\Delta h$	m = mass (kg) g= 10 N/kg Δh = height change (m)	Energy stored due to height. Example: 3 kg lifted 2 m Ep = 60.0 J
Work done J	$W = Fd$	F = force (N) d = distance (m)	Work done along direction of force. Example: 50 N over 3 m W = 150 J
Energy transferred by power W (or Js^{-1})	$\Delta E = Pt$	P = power (W) t = time (s)	Energy supplied or used. Example: 100 W for 60 s ΔE = 6000 J
Thermal energy (temperature change) J	$E(thermal) = mc\Delta T$	m = mass (kg) c = specific heat capacity (J/kg·°C) ΔT = temperature change (°C)	Energy to heat or cool. Example: 2 kg water ΔT = 30°C E = 252,000 J
Thermal energy (phase change) J	$E(thermal) = mL$	m = mass (kg) L = latent heat (J/kg) e.g. L_f (latent heat of fusion, H_2O) = 334,000 J/kg	Energy for melting, freezing, boiling, condensing. Example: 0.5 kg ice E=167,000 J

Note: This resource does NOT cover P = VI and V = IR