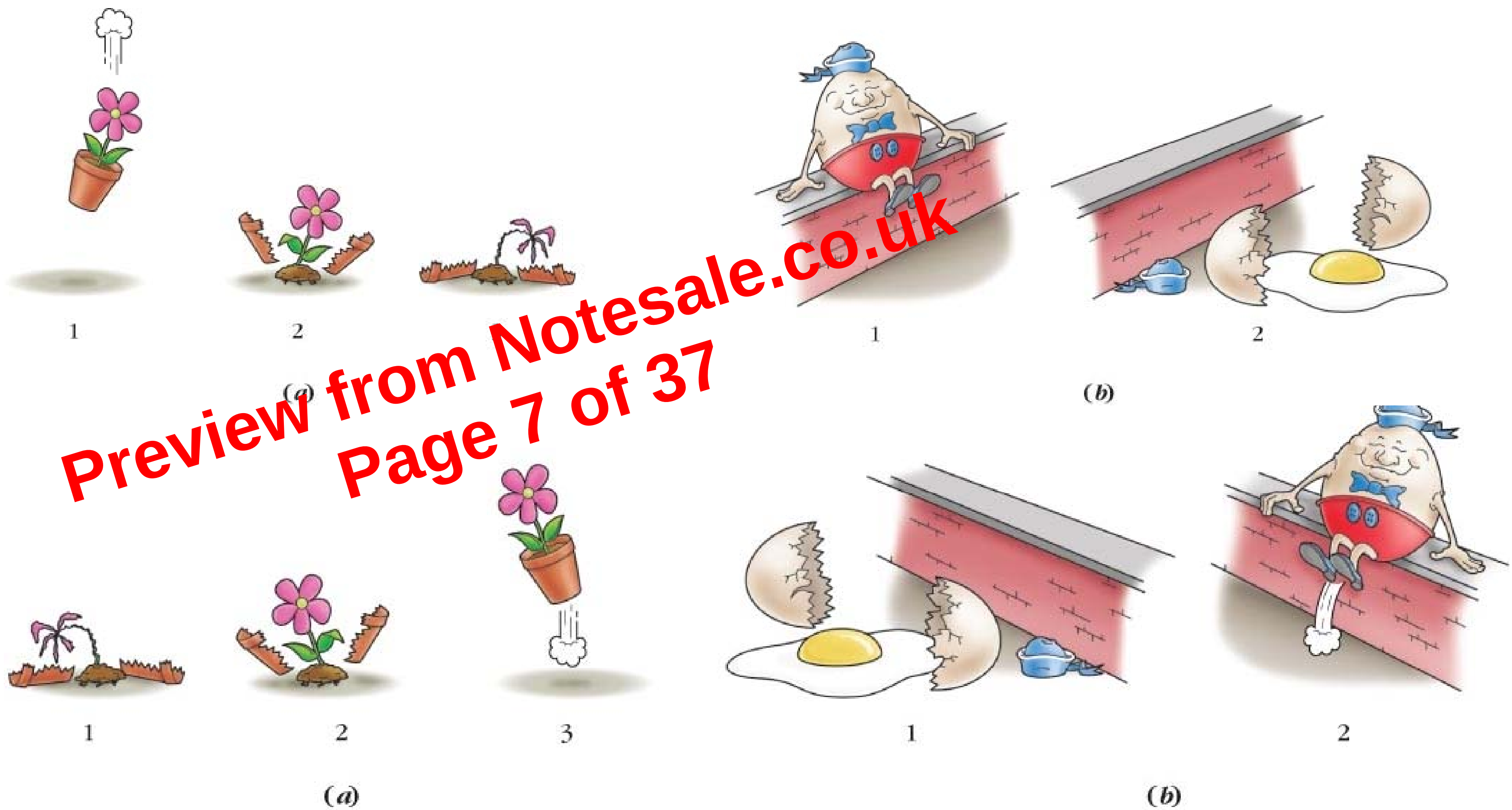


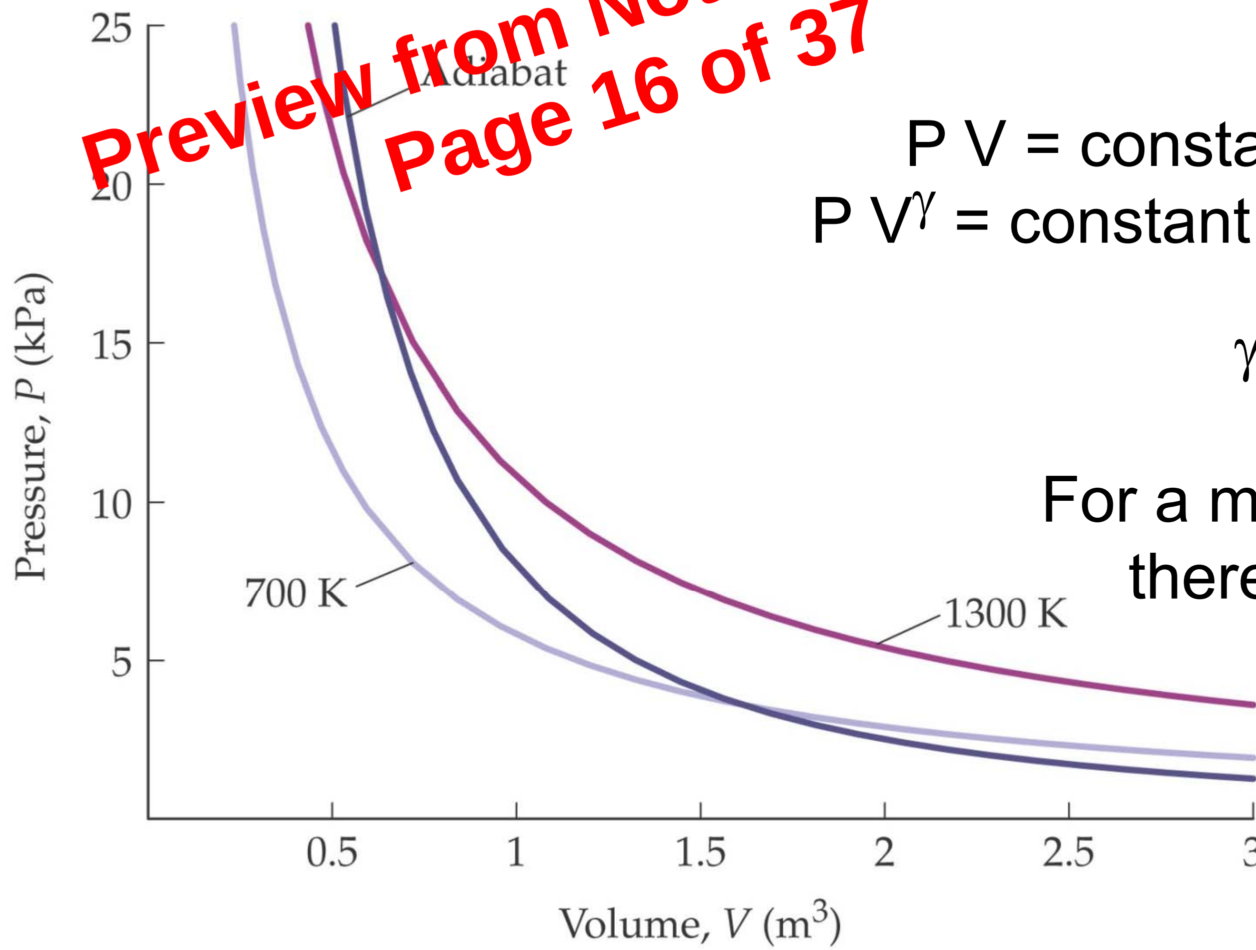
"Humpty Dumpty sat on a wall.
Humpty Dumpty had a great fall
All the king's horses and all the king's men
Couldn't put Humpty Dumpty together again"

** Martin Schullinger-Krause (PH202 Winter 2008)*

Adiabatic ("not passable") processes

(no heat is gained or lost by the system Q=0, i.e. system perfectly isolated)

Q=0 and so ΔU= -W



P V = constant (isothermal)

P V^{γ} = constant (adiabatic)

$\gamma = C_P/C_V$

For a monoatomic gas therefore γ = 5/3

If an amount of heat Q flows into a system at constant temperature, then the change in entropy is

$$\Delta S = \frac{Q}{T}.$$

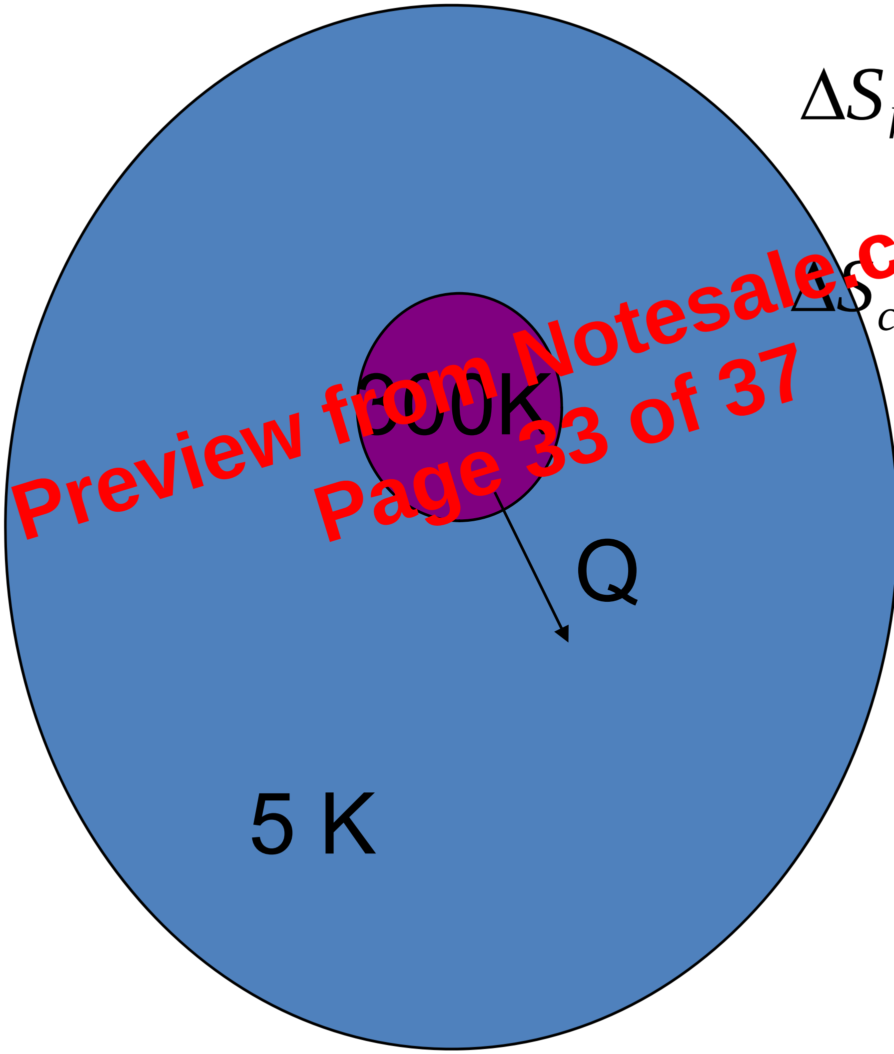
Every irreversible process increases the total entropy of the universe. Reversible processes do not increase the total entropy of the universe.

Example: An ice cube at 0.0 °C is slowly melting. What is the change in the ice cube's entropy for each 1.00 g of ice that melts?

To melt ice requires $Q = mL_f$ joules of heat. To melt one gram of ice requires 333.7 J of energy.

The entropy change is

$$\Delta S = \frac{Q}{T} = \frac{333.7\ \text{J}}{273\ \text{K}} = 1.22\ \text{J/K}.$$



$$\Delta S_{hot} = \frac{Q}{T} = \frac{-300\ \mathrm{J}}{300\ \mathrm{K}} = -1\ \mathrm{J/K}.$$

$$\Delta S_{cold} = \frac{Q}{T} = \frac{+300\ \mathrm{J}}{5\ \mathrm{K}} = 60\ \mathrm{J/K}.$$

http://www.youtube.com/watch?v=Xa6Pctf23tQ

Statistical Interpretation of Entropy

A **microstate** specifies the state of each constituent particle in a thermodynamic system. A **macrostate** is determined by the values of the thermodynamic state variables.