P7 Module Outline

- Describe for situations where there are energy transfers in a system, that there is no net change to the total energy of a closed system (qualitative only)
- Describe all the changes involved in the way energy is stored when a system changes for common situations
- Describe the changes in energy involved when a system is changed by heating (in terms of temperature change and specific heat capacity) by work done by forces and by work done when a current flows
- Make calculations of the energy changes associated with changes in a system recalling or selecting the relevant equations for mechanical electrical and thermal processes thereby express in quantitative form and on a common scale the overall redistribution of energy in the system
- Calculate the amounts of energy associated with a moving body a stretched spring and an object raised above ground level
- Describe with examples the process by which energy is dissipated so that it is stored in less useful ways
- Describe how in different domestic devices energy is transferred from batteries or the ac from the mains
- Describe with examples the relationship between the power ratings for domestic electrical appliances and how this is linked to the changes in stored energy when they are in use
- Calculate energy efficiency for any energy transfer
- **Describe ways to increase efficiency (Higher only)**
- Explain ways of unwanted energy transfer
- Describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls (qualitative only)

P7 Formulae to Learn

Efficiency = useful output energy transfer (J) / input energy transfer (J)

Kinetic energy (J) = 0.5 x mass (kg) x (speed (m/s))^2 KE = ½mv^2 (Also in P2)

Work done (J) = Force (N) x distance (m) (along the line of action of the force) (Also in P2)

Power (W) = work done (J) / time (s) (Also in P2)

Potential energy (J) = mass (kg) x height (m) x gravitational field strength, g (N/kg) GPE = mgh (Also in P2)

Energy transferred (J) = charge (C) x potential difference (V) E = QV (Also in P3)

Power (W) = potential difference (V) x current (A) = current (A))^2 x resistance (Ω) P = IV = I^{2}R (Also in P3)

Energy transferred (J, kWh) = power (W, kW) x time (s,h) (Also in P3)

P7 Formulae to Use (provided in the exam)

Change in thermal energy (J) = mass (kg) x specific heat capacity (J/kg°C) x change in temperature (°C) E = mcΔT (Also in P1)

Thermal energy for a change in state (J) = mass (kg) x specific latent heat (J/kg) E = mL (Also in P1)

Energy transferred in stretching (J) = 0.5 x spring constant (N/m) x (extension (m))^2 E = 0.5ke^2 (Also in P2)