PENANG SANGAM HIGH SCHOOL
YEAR 11 PHYSICS
WEEK 17

Strand	ENERGY
Sub Strand	THERMAL ENERGY
Content Learning Outcome	At the end of the lesson students should be able to • Apply the law of conservation of energy to solve energy problems

THERMAL ENERGY

Heat flows from a region of high temperature to a region of low temperature until all the regions are at the same temperature. Temperature is how hot an object is.

Heat transfer

a. **Conduction**- this is the heat transfer in solids without the movement of particles.
b. **Convection** – this is the heat transfer in liquids and gases with the movement of particles. Convection needs gravity to work therefore it cannot take place in vacuum or space.
c. **Radiation** – this is the heat transfer through electromagnetic waves. All bodies radiate. This can take place anywhere.

i. Dull, black, rough surfaces are good radiators, good absorbers, good emitters but bad reflectors.
ii. Shiny, silver and polished surfaces are bad radiators, bad absorbers, bad emitters but good reflectors.

substance	Specific heat capacity in J/kg^0C
WATER	4200
ALCOHOL	2400
ICE	2100
ALUMINIUM	960
GLASS	670
IRON	440
COPPER	400

When ever there is a temperature change either increase or decrease then the energy can be calculated by the formula

E = m c ΔT

M – mass in kg, c is the specific heat capacity, ΔT can either be the temperature or change in temperature.

Power is given by the formula

$$P = \frac{ENERGY}{TIME} \qquad P = \frac{WORKDONE}{TIME}$$

POWER in watts W, energy in joules J, and time must always be in seconds.

1. 3kg water is at a temperature of 56^0C. Find the energy it has.

   E = **m c ΔT**
   = 3(4200)(56)
   = 705,600J

2. 2.5kg of copper is at a temperature of 30^0C. How much energy is required to get the temperature to 78^0C.

3. 453600J of energy is supplied to 3kg of water which is at a temperature of 20^0C.
   i. Find the change in temperature of water
   ii. Find the new temperature of water

4. A heater is immersed in 2kg of water at 45 ^0C. The temperature becomes 72^0C in 5minutes.
   i. Find the energy given out by the heater
   ii. Find the heaters power