RELATION BETWEEN GCV AND NCV:-

- GCV = NCV + Latent heat of condensation of steam
- NCV = GCV – Latent heat of condensation of steam

RELATION BETWEEN GCV AND NCV:-

- NCV = GCV –9 ×Mass of hydrogen × Latent heat of steam
- NCV = GCV – 0.09 × % of hydrogen × Latent heat of steam.

(latent heat of steam = 587cal/g)

GCV FORMULA FOR BOMBS CALORIMETER:-

$$GCV = \frac{M * Cp * (t_2 - t_1)}{m}$$

Notations:

- Mass of the fuel sample taken = m gm
- Mass of water taken in the copper calorimeter = W gm
- Water equivalent of calorimeter = w gm
- Initial temperature of water = t1 0C
- Final temperature of water = t2 0C
- Specific heat of water = Cp = 1cal/g

ACID CORRECTION FORMULA:-

$$GCV = \frac{(W + w)[(t_2 - t_1) + tc] - (tf + ta)}{M}$$

Fuse Wire Correction (tf), Acid Correction (ta), Cooling correction (tc)

GCV FORMULA FOR BOY'S CALORIMETER:-

$$GCV = \frac{W\,(t2 - t1) \times Cp}{V}$$

(V)denotes **volume of fuel**

NCV FORMULA FOR BOYS CALORIMETER:-

$$NCV = \frac{W\,(t2 - t1) \times Cp}{V} - \frac{m \times 587}{V}$$

Latent heat of steam per m3 of fuel sample $= \frac{m \times 587 \text{ kcal}}{V}$

PROXIMATE ANALYSIS:-

Percentage	Name of Instrument	Temperature	Duration	Formula
Moisture(M) %	Oven	110^0C	60 min	$m2 = \frac{m-m1}{m} * 100$
Volatile Matter(Vm) %	Muffle Furnace	$950^0 \pm 25$	7 min	$Vm = \frac{m1 - m2}{m} * 100$
Ash content(Ash)%	Muffle Furnace	750^0C	30 min	$\frac{weight\ of\ residue}{m} * 100$
Fixed Carbon(FC) %	-	-	-	100-(M%+Vm%+Ash%+FC%)

ULTIMATE ANALYSIS:-

FOR CARBON:

$$\%Carbon(C) = \frac{12*x*100}{44*W}$$

FOR HYDROGEN:-

$$\% \text{ Hydrogen(H)} = \frac{2*y*100}{18*W}$$

FOR NITROGEN: -

$$\%N = \frac{(V_2 - V_1) * X * 14*100}{1000 * W}$$

Here 'x' denotes normality for NaOH.

FOR SULPHUR:-

$$\%S = \frac{a * 32 * 100}{233 * W}$$

QUANTITY OF AIR REQUIRED FOR COMBUSTION(kg):-

$$\text{Quantity of Air (In kg)} = O_2 \text{ req. (in Kg)} \times 100 / 23$$

VOLUME OF AIR REQUIRED FOR COMBUSTION(m3): -

$$\text{Volume of Air (in m}^3\text{)} = O_2 \text{ req (in m3)} \times 100 / 21$$