1) Calculating the entropy of Target Variable "taste".

Taste = "Meh" = 5
     = "Yummy" = 5

$$\text{Entropy}(S)_{\text{taste}} = -(P_{\oplus} \log_2 P_{\oplus} + P_{\ominus} \log_2 P_{\ominus})$$

$$= -\left[\frac{5}{10} \log_2 \frac{5}{10} + \frac{5}{10} \log_2 \frac{5}{10}\right]$$

$$= -\left[\frac{1}{2} \log(0.5) + \frac{1}{2} \log_2 (0.5)\right]$$

$$= -\left[\frac{1}{2}(-1) + \frac{1}{2}(-1)\right]$$

$$= -\left[-1\right]$$

$$= 1$$

There is impurity of 100% as it is non-homogenous

2) Calculating the information gain for Visual defects parameter.

We have the Entropy of Target variable as '1' for taste variable.
Calculating Entropy for the variable Visual defects.

= Values (Visual defect) = Some, None, Many

$S = |5\text{ meh}, 5\text{ yummy}|$

$S_{some} = |3\text{ meh}, 0|$

$S_{none} = |2\text{ meh}, 2\text{ yummy}|$

$S_{many} = |0, 3\text{ yummy}|$

$$GAIN(S, A) = Entropy(S) - \sum_{v \in values(A)} \frac{|S_v|}{|S|} Entropy$$

$$Gain(S, Visual\ defect) = Entropy(S) -$$

$$\left(\frac{3}{10} Entropy(S_{some}) + \frac{4}{10} Entropy(S_{none}) + \frac{3}{10} Entropy(S_{many}) \right)$$

$$Gain(S, Visual\ defects) = 1 -$$
$$\left(\frac{3}{10} Entropy(S_{some}) + \frac{4}{10} Entropy(S_{none}) + \frac{3}{10} Entropy(S_{m}) \right)$$

$$Entropy(S_{some}) = -\left(\frac{3}{3} \log_2 \left(\frac{3}{3} \right) + 0 \right) = 0$$

$$Entropy(S_{none}) = -\left(\frac{2}{4} \log_2 \left(\frac{2}{4} \right) + \frac{2}{4} \log_2 \left(\frac{2}{4} \right) \right)$$

$$Entropy(S_{many}) = -\left(0 + \frac{3}{3} \log_2 \left(\frac{3}{3} \right) \right)$$

Entropy (S_{some}) = 0
Entropy (S_{none}) = 1
Entropy (S_{many}) = 0

Gain $(S, Visual\ defect)$ = Entropy (S) -
$\left(\dfrac{3}{10}(0) + \dfrac{4}{10}(1) + \dfrac{3}{10}(0) \right]$.

$= 1 - \dfrac{4}{10}$

$= \dfrac{6}{10}$

$= 0.60$.

The information gain is 0.6.

3) The value can be =
Entropy $H($ Taste | Visual Defect == some $)$
$= -\dfrac{3}{3} \log_2 \left(\dfrac{3}{3} \right) - 0 \log_2 (0)$

$= 0 - 0$

$= 0$

Entropy $H($ Taste | Visual Defect == none $)$
$= -\left(\dfrac{2}{4} \log_2 \left(\dfrac{2}{4} \right) + \dfrac{2}{4} \log_2 \left(\dfrac{2}{4} \right) \right)$

$= -\left(-\dfrac{1}{2} - \dfrac{1}{2} \right) \quad = \quad 1$