Question 1

$$H(Y) = -\sum_{i=1}^{K} P(y = y_i) \log_2 P(y = y_i)$$

$$P(\text{taste} = \text{Meh}) = \frac{5}{10}$$

$$P(\text{taste} = \text{Yummy}) = \frac{5}{10}$$

$$\therefore H(\text{taste}) = \frac{-5}{10} \log_2 \left(\frac{5}{10}\right) - \left(\frac{5}{10}\right) \log_2 \left(\frac{5}{10}\right) = 1$$

Ans

Question 2

visual defects	Taste		
	Meh	Yummy	Total
Some	3	0	3
None	2	2	4
Meh	0	3	3
			10

$$H(\text{taste} \mid \text{visual defects})$$

$$= \frac{3}{10} H(0,3) + \frac{4}{10} \left\{ -\frac{2}{4} \log_2 \left(\frac{2}{4}\right) - \frac{2}{4} \log_2 \left(\frac{2}{4}\right) \right\} - \frac{3}{10} H(3,0)$$

$$= 0 + 0.4 \times 1 + 0 = 0.4$$

$$IG(\text{visual defects}) = H(\text{taste}) - H(\text{taste} \mid \text{visual defects})$$

$$= 1 - 0.4 = 0.6$$

Ans

Question 3

$$H(\text{taste/visual defect} == \text{some})$$

$$= \frac{3}{10}\left\{-\frac{3}{3}\log_2\left(\frac{3}{3}\right) - \frac{0}{3}\log_2\left(\frac{0}{3}\right)\right\}$$

$$= 0$$

$$H(\text{taste/visual defect} == \text{None})$$

$$= \frac{4}{10}\left\{-\frac{2}{4}\log_2\left(\frac{2}{4}\right) - \frac{2}{4}\log_2\left(\frac{2}{4}\right)\right\}$$

$$= 0.4$$

Ans