Q7)

We have used Bayes' theorem to calculate the probability of an individual being sick given a positive or negative test result. Let s represent the event of an individual being sick, and ns represent the event of an individual not being sick. Similarly, let p represent the event of a positive test result, and n represent the event of a negative test result.

Given the following information:

* The probability of an individual being sick, P(s), is 0.2.
* The probability of a positive test result given an individual is sick, P(p|s), is 0.95.
* The probability of a positive test result given an individual is not sick, P(p|ns), is 0.1.
* The probability of a negative test result given an individual is sick, P(n|s), is 0.05.
* The probability of a negative test result given an individual is not sick, P(n|ns), is 0.9.

We can calculate the probability of an individual being sick given a positive or negative test result using Bayes' theorem:

P(s|p) = P(p|s) \* P(s) / P(p)

where P(p) is the probability of a positive test result, calculated as:

P(p) = P(p|s) \* P(s) + P(p|ns) \* P(ns)

Since P(ns) is the complement of P(s), we can calculate it as 1 - P(s). Substituting all the values, we get:

P(p) = 0.95 \* 0.2 + 0.1 \* 0.8 = 0.215

Now, we can calculate the probability of an individual being sick given a positive test result:

P(s|p) = 0.95 \* 0.2 / 0.215 = 0.8837

Therefore, the probability of an individual being sick given a positive test result is approximately 0.8837, or 88.37%.

Similarly, we can calculate the probability of an individual being sick given a negative test result:

P(n) = P(n|s) \* P(s) + P(n|ns) \* P(ns)

Substituting the values, we get:

P(n) = 0.05 \* 0.2 + 0.9 \* 0.8 = 0.725

Now, we can calculate the probability of an individual being sick given a negative test result:

P(s|n) = P(n|s) \* P(s) / P(n) = 0.05 \* 0.2 / 0.725 = 0.0138

Therefore, the probability of an individual being sick given a negative test result is approximately 0.0138, or 1.38%.