22. Solution: D

Let

H = Event of a heavy smoker

L = Event of a light smoker

N = Event of a non-smoker

D = Event of a death within five-year period

Now we are given that $\Pr[D|L] = 2\ \Pr[D|N]$ and $\Pr[D|L] = \frac{1}{2}\Pr[D|H]$

Therefore, upon applying Bayes' Formula, we find that

$$\Pr[H|D] = \frac{\Pr[D|H]\Pr[H]}{\Pr[D|N]\Pr[N] + \Pr[D|L]\Pr[L] + \Pr[D|H]\Pr[H]}$$

$$= \frac{2\Pr[D|L](0.2)}{\frac{1}{2}\Pr[D|L](0.5) + \Pr[D|L](0.3) + 2\Pr[D|L](0.2)} = \frac{0.4}{0.25 + 0.3 + 0.4} = 0.42$$