13 Ignorance in Coding

I.B. Lazy has been told to design a good code that represents a sequence of source letters drawn independently from an alphabet of 2^n letters. The letter probabilities are p_i, $i = 1, \ldots, 2^n$. Rather than design a code, he decides to just use a fixed-length code and go home early.

(a) How much worse than a well-designed code can Lazy's code be?

When he comes in the next day, Lazy's bosses don't realize his sloppiness because the problem has been redefined, becoming more complicated. The source probability distribution can be, with equal probability, *either* p_i or q_i. Whichever distribution governs the source, it applies for all time. Now that the problem has become more interesting, Lazy gets to work.

(b) His personality has not changed, however. He decides just to use one of the optimally designed codes derived from the two probability distributions. Which one should he use?