1.

$A \to 0 : 2, 4, 8, E$
$A \to 1 : 3, 9$
$A \to 2 : 1, B$
$A \to 3 : 0, A, 5, F, 6, C, 7, D$
Now suppose two inputs of 5 and F which xor to A and output as 3
S0L = S0E $\oplus$ S0K
S0k = S0E $\oplus$ S0L
$0 \oplus 5 = 5$
$A \oplus 5 = f$
$B \oplus 5 = 3$
$C \oplus 5 = 9$
$7 \oplus 5 = 2$
$D \oplus 5 = 8$
$F \oplus 5 = A$
$5 \oplus 5 = 0$
$0 \oplus F = f$
$A \oplus F = 5$
$B \oplus F = 9$
$C \oplus F = 3$
$7 \oplus F = 8$
$D \oplus F = 2$
$F \oplus F = 0$
$5 \oplus F = A$
Thus the possible keys are $\{5, f, 3, a, 2, 8, a, 0\}$ which can be narrowed down further by repeating this process

2.

$H(K|C) = H(K) + H(P) - H(C)$
$H(X) = -\sum_{i=1}^{n} p_i log_2 p_i$
$H(K) = H(X)|X = \frac{1}{2}, \frac{1}{4}, \frac{1}{4} = 1.5$
$H(K) = H(X)|X = \frac{1}{3}, \frac{1}{6}, \frac{1}{2} = 1.459$
$P_C(C_i) = \sum_{\forall e_{k_i}(p_j) = C_i} P(k_i) * P(p_j)$
$H(C) = H(X)|X = \frac{7}{24}, \frac{5}{12}, \frac{1}{8}, \frac{1}{6} = 1.851$
$H(K) + H(P) - H(C) = 1.108$