(b) $P(w|Q, R=0) = \frac{c(w|C)}{|C|}$

with $|C|$ representing the total number of words in $C = D_1, \ldots D_n$

(c) $P(w|Q, R=1) = \frac{c(w|q)}{|q|}$

with $|q|$ representing the total number of words in q

(d) $p(w|Q, R=1) = (1-\lambda)\frac{c(w|q)}{|q|} + \lambda P(w|REF)$.

(e)

$$score(Q,D) \propto \sum_{w \in V} c(w,D) \log \frac{P(w|Q,R=1)}{P(w|Q,R=0)}.$$

$$= \sum_{\substack{w \in V \\ w \in q}} c(w,D) \log P(w|Q,R=1) + \sum_{\substack{w \in V \\ w \notin q}} c(w,D) P(w|Q,R=1)$$

$$- \sum_{w \in V} c(w,D) \log P(w|Q,R=0)$$