3) O X Y M O R O N

a) $H = -\frac{1}{8}\left[3\ln\left(\frac{3}{8}\right) + \ln\left(\frac{1}{8}\right) + \ln\left(\frac{1}{8}\right) + \ln\left(\frac{1}{8}\right) + \ln\left(\frac{1}{8}\right) + \ln\left(\frac{1}{8}\right)\right]$

               O   X   Y   M   R   N

    $= \boxed{1.667}$

b) $\underline{O \quad O \quad O} \;+\; \underline{X \quad Y \quad M \quad R \quad N}$

$H_1 = -\frac{3}{3}\ln\left(\frac{3}{3}\right) = 0 \qquad H_2 = -\frac{5}{5}\ln\left(\frac{1}{5}\right) = 1.609$

$H = \frac{3}{8}(0) + \frac{5}{8}(1.609) = 1.006$

$1.667 - 1.006 = \boxed{0.661 \text{ bits of information gained}}$

c) Maximum possible entropy for eight letters:

$\qquad -\frac{8}{8}\ln\left(\frac{1}{8}\right) = \boxed{2.079 \text{ bits for all letters different}}$

d) Higher entropy is better in Scrabble so you can make more words with the greater variety of letters. If entropy is low, then there are too many duplicate letters, which are redundant.