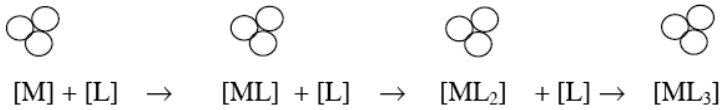
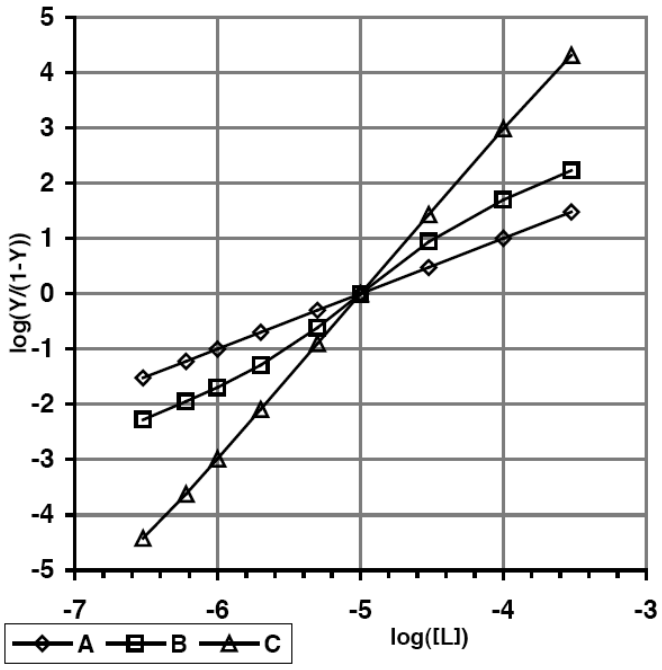


1. A protein with a trimeric quaternary structure (homotrimer) binds 3 ligands (one binding site per monomeric subunit). This protein can be isolated from elves (A), dwarves (B) and hobbits (C). Extreme cooperativity is indicative of hairy toes whereas noncooperativity is indicative of pointy ears. The Hill plot for each protein is shown below where

$$\log\frac{Y}{(1-Y)} = \log K_{D} + n_h \log[L].$$



i) What is the K_D^{ave} for each protein?

ii) Determine which group has hairy toes and which has pointy ears.

iii) For which group is the K_D^{ave} the actual K_D?

2. An enzyme reduces the energy of the transition state by 20 kJ/mol compared to the un-catalyzed reaction. What is the rate enhancement of the reaction by this enzyme at 300K (R=8.3 J/mol-degK)?