



**FIGURE 9.10. Genomic rearrangements** are required to produce a functional immunoglobulin-encoding gene. Immature B cells contain a number of different DNA segments that encode many potential alternative portions of an antibody molecule. These portions, however, are not joined together through exon/intron splicing but instead are combined through an enzymatically mediated recombination process, called V(D)J recombination, that results in permanent genomic rearrangement in each cell. (A) Antibodies consist of four protein chains, two identical short (light) and two identical long (heavy) chains. Within these chains, the variable regions produced through recombination are V (red), D (purple, heavy chain only), and J (blue). (B) During the differentiation of B cells, a random combination of VL and JL sequences is brought together with the constant (CL) region to produce the light chain. Similarly, a random combination of VH, DH, and JH sequences codes for the heavy chain (not shown).

9.10, redrawn from deVillartay J.-P. et al., *Nat. Rev. Immunol.* 3: 962–972, © 2003 Macmillan, [www.nature.com](http://www.nature.com)