9.2.2 Classification of Multiple Quantum Wells and Superlattices
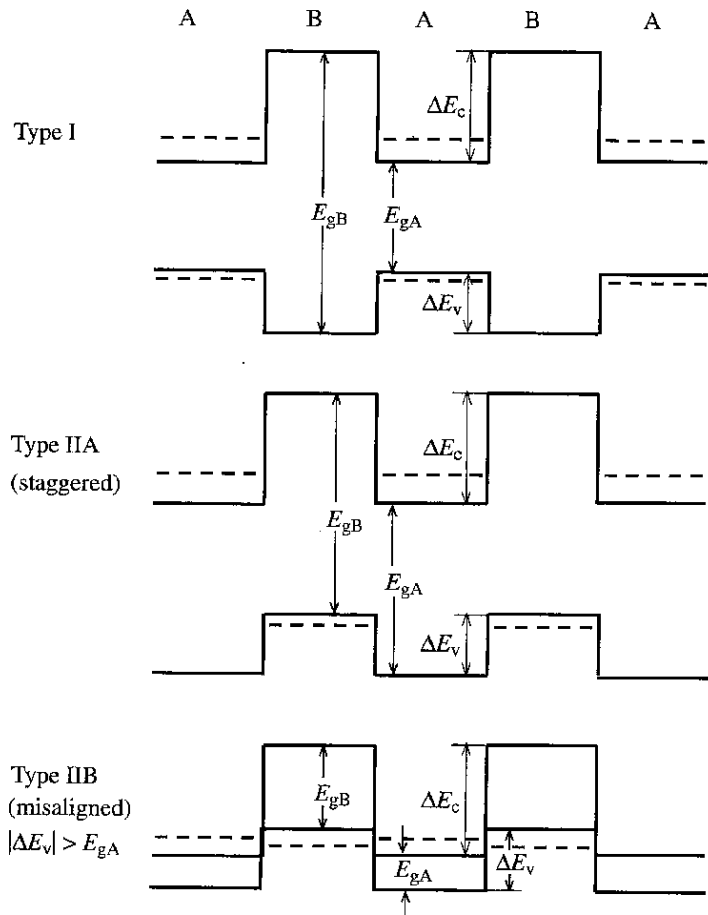
Anderson affinity rule for heterojunctions

A   B   A   B   A

Type I

ΔE_c

E_{gB} E_{gA}

ΔE_v

Type IIA
(staggered)

ΔE_c

E_{gB}

E_{gA}

ΔE_v

Type IIB
(misaligned)
$|\Delta E_v| > E_{gA}$

E_{gB} ΔE_c

E_{gA} ΔE_v

(a)

E_{vac} E_{vac}

$q\,\chi_1$

$q\,\chi_2$

E_{c1}

ΔE_c

E_{c2}

E_{F2}

E_{v2}

E_{F1}

ΔE_v

E_{v1}

$\Delta E_g = E_{g1} - E_{g2}$
$\quad = \Delta E_c + \Delta E_v$

(b)

E_{vac} - - - - - - - - - - - - - - - - - - E_{vac}

$q\,\chi_1$ qV_0

E_{vac}(loc)

E_c

qV_{01}

ΔE_c $q\chi_2$

E_i - - - - -

qV_{02}

$qV_0 = q\,(V_{01} + V_{02})$

E_F - - - -
E_v - - - - - - - - - - - E_i

ΔE_v

$\dfrac{V_{01}}{V_{02}} = \dfrac{\epsilon_2 N_{d2}}{\epsilon_1 N_{a1}}$
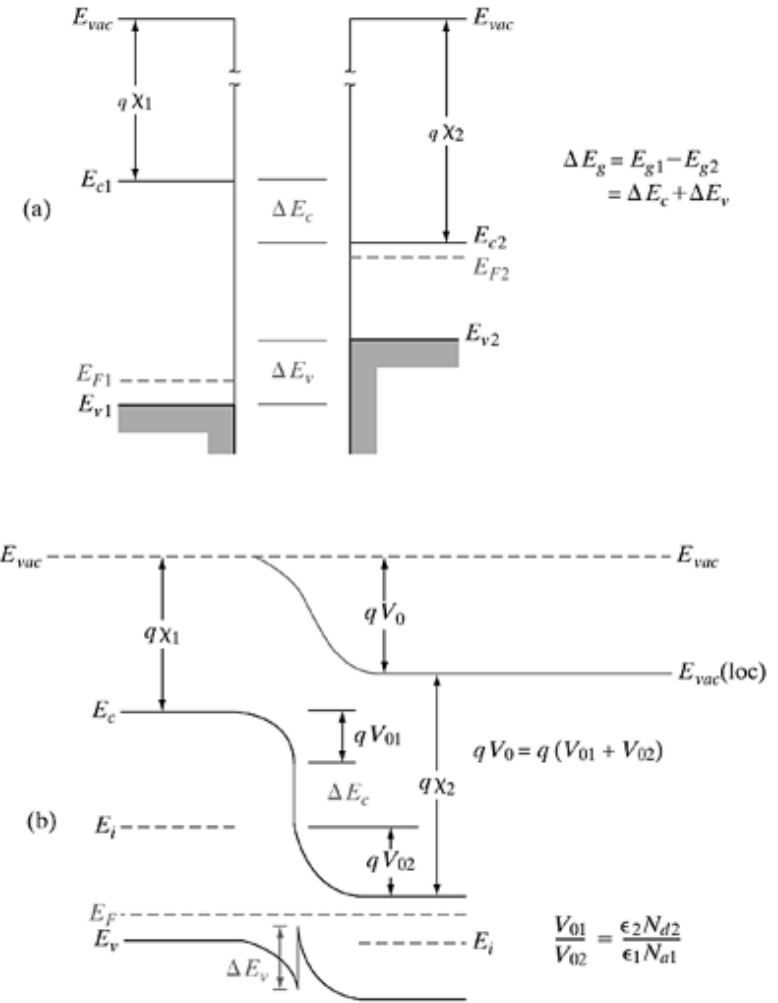
9.2.3. Confinement of Electrons and Holes

Consider a finite square well as a model for QW:

(a) Confinement

(b) Uniaxial Compression along [001]