1.1:

Advantages:	diode	gas or solid state
higher wall plug efficiency (direct electrical pumping allows higher efficiencies)	$\approx 50\%$	$\approx 1\%$ ($< 10\%$)
longer lifetimes	$\approx 10^6\ h.$	$\approx 10^3\ h.$
higher frequency modulation is possible due to direct electrical pumping	$\approx 10\ GHz$	$\approx 100\ MHz$
small size due to higher gain (≈ 1000 cm^{-1} vs. < 5 cm^{-1})	< 1 mm	> 10 cm
cheaper		
wavelength ranges and size make diode lasers better for fiber optic systems		

Disadvantages:		
larger divergence angle due to the small cross sectional area makes collimating optics necessary for free space applications.	$\approx 30^o$	$\approx 0.1^o$
elliptical mode shape is less desirable than circular TEM mode of gas and solid state lasers		
larger linewidth (less coherence) due to larger gain bandwidth (atomic transition has narrower linewidth than band to band transition)		
wavelength is more reproducable	$> 1\ \mathring{A}$	small
larger temperature sensitivity than the atomic transitions of solid state lasers	$\approx 5\mathring{A}/C$	small
lower power		
more limited wavelength range		
more difficult to tune wavelength		
energy storage is smaller due to smaller cavity volume		

1.2:

Most III-V materials have a direct bandgap, while silicon has an indirect bandgap. This means that carriers with the minimum conduction band energy have the same momentum as carriers with the maximum valance band energy. Therefore, optical transitions in silicon — unlike those in III-V materials — require the interaction of a phonon with an electron-hole pair in order to conserve momentum. This requirement makes optical transitions much less likely in silicon than in III-V materials and thus makes silicon optical devices much less efficient, if they are possible at all.

Also, III-V materials offer a choice of bandgaps through the growth of ternary and quaternary compounds with varied bandgap energies, indices, and strain levels. This allows bandgap engineering to provide carrier and photon confinement. Silicon devices are limited to the silicon bandgap.

1.5:

For 2 single state QWs that are brought together, there are two bound states: a symmetric state and an antisymmetric state. Similarly, assuming that the wells are not brought close enough to push states out of the wells, there will be 20 bound states in the system of 10 wells with 2 bound states each.

Therefore, there are 20 bound states.