"Basic concepts of nanomedical systems"

I. Features of Nanomedicine
   A. Bottoms up rather than top down approach to medicine
   B. Nano-tools on the scale of molecules
   C. Cell-by-cell repair approach – regenerative medicine
   D. Feedback control system to control drug dosing

II. Elements of good engineering design
   A. Whenever possible, use a general design that has already been tested
   B. Use multiple specific molecules to do multi-step tasks
   C. Control the order of molecular assembly to control the order of events
   D. Therefore, perform the molecular assembly in reverse order to the desired order of events

III. Building a nanodevice
   A. Choice of core materials
   B. Add drug or therapeutic gene
   C. Add molecular biosensors to control drug/gene delivery
   D. Add intracellular targeting molecules
   E. Result is multi-component, multi-functional nanomedical device
   F. For use, design to de-layer, one layer at a time
   G. The multi-step drug/gene delivery process in nanomedical systems

IV. The challenge of drug/gene dosing to single cells
   A. Precise targeting of drug delivery system while protecting non-targeted cells from exposure to the drug
   B. How to minimize mis-targeting
   C. How to deliver the right dose per cell
   D. One possible solution – in situ manufacture of therapeutic genes

References: