Please complete parts A and B **prior to class** on Monday April 11, 2016. You can submit section C at anytime before the end of the course.


Some helpful definitions:
- Seronegative individuals have no circulating anti-HIV antibodies and are presumably not infected.
- Seropositive individuals have antibodies against the HIV virus.

Please answer the following questions with 2 or 3 sentences (1 pt each):

1. What cell receptor is required for infectivity of all strains of HIV virus?
2. What is the difference between M-tropic, T-tropic, and dual-tropic HIV strains?
3. What is the function of CCR-5 in normal healthy individuals?
4. How does the mutant CCR-5 differ from the wild-type (Figure 1)? Do you expect the mutant protein to be functional? If so, does its loss of function lead to any defects in the immune system, based on this article?
5. What experimental technique was used to identify the presence of the mutant allele in individuals (Figure 3)?
6. Table I gives the number of mutant alleles found in seronegative and seropositive HIV patients. How does this data support the main conclusion of this paper?

**B. Genetic Immunodeficiencies.**

There are two types of individuals with SCID (severe combined immunodeficiencies):
- i) Lacking both B and T cells (B⁻ T⁻)
- ii) Lacking only T cells (B⁺ T⁻)

List as many genetic deficiencies that you can think of that could cause the above two types of SCID. The more correct deficiencies you list, the more points you get!

**C. Gene Therapy**

1. Briefly describe the CRISPR system for genome editing (just 2-4 sentences please).
2. How could you use CRISPR as a treatment for a genetic deficiency that causes SCID? (Yes, this is simple)
3. Why would it be more difficult to employ CRISPR technology to prevent HIV infections (Hint: see table 1 and table 2 of the ccr5 paper).