7.012 Section Problem-Immunology I

A.

You would like to generate antibodies against a specific antigen, antigen A, derived from a mammalian virus. You inject a rabbit with antigen A to hopefully elicit antibodies, and you assay antigen A specific antibody levels in rabbit blood every seven days. On day 28 you inject the same rabbit with more antigen A and measure antibody response for the next four weeks.

The results of your measurements are shown below. As a necessary control, you tested the blood of this rabbit prior to any injections (0 time point).

Days after injection	Presence of antibodies against antigen A
(before injection) 0	-
7	++
14	++
21	+
28	+
35	++++++++
42	+++++++
49	++++++

a) Why is the antibody response low on day 28 and high after day 35?

b) Antibodies to antigen A were detected on day 0 (prior to injection of antigen A) in a second rabbit in this study. How could this be explained?

c) Suppose on day 28 the rabbit was injected with both antigen A and a different antigen, antigen B.

i) Would you expect the levels of antibody against antigen B on day 35 to be higher, lower, or the same as the levels of antibodies against antigen A?

ii) Draw a graph indicating the levels of antibodies to antigens A and B vs. time.

Day

B.

A cell clone represents identical cells that have descended from a single progenitor cell. You are a new UROP in an immunology lab and have been given the following task. You are to determine the specificity of two helper T cell clones (T_HA, and T_HB) that were found in the freezer. All T_HA cells express the same T cell receptor (TCR). All T_HB cells express the same TCR (a TCR distinct from the TCR expressed by T_HA).

You grow two different cell types, a B cell clone or macrophages. To each cell type you add a T_H cell clone with either virus 1 or virus 2 and determine if the cells are stimulated to divide. The data is given below. Stimulation is denoted +, no stimulation is denoted –.

Cell Type	virus added	T_HA	T_HB
B cell clone	1	+	-
B cell clone	2	-	-
macrophage	1	+	-
macrophage	2	-	+

a) Which virus do T_HA cells recognize?

b) Which virus do T_HB cells recognize?

c) Why are T_HA cells stimulated to grow by B cells plus virus 1, but not by B cells plus virus 2?

d) Why are T_HB cells stimulated to grow by macrophages plus virus 2, but not by B cells plus virus 2?