1. Which of the following contribute to the defensive role of the digestive tract? (5)
   a. Peyer’s Patches.
   b. Plicae circularis.
   c. Myenteric Plexis.
   d. IgA.
   e. Adenoids.

2. Cortisol is a steroid hormone produced by the adrenal cortex. Parathyroid hormone is a protein hormone produced by the parathyroid gland. Which of the following is/are TRUE? (5)
   a. Both cortisol and parathyroid hormone bind to receptors in the cell membrane of their target cells.
   b. Cortisol is stored in secretory vesicles before its release.
   c. Hormones like parathyroid hormone activate second messenger systems after binding to their receptors.
   d. Cortisol would be cleared from the body faster than parathyroid hormone.
   e. Cortisol is bound to a carrier protein for transport in the blood.

3. One of the major symptoms for Multiple Myeloma, a form of cancer, is an extremely high concentration of monoclonal antibodies in the blood. Based on this criterion, you would predict that this disease involves uncontrolled proliferation of which cells? (5)
   a. CD8 lymphocytes.
   b. Cytotoxic T cells.
   c. Helper T cells.
   d. Interleukins.
   e. Plasma cells.

4. A benign tumor of the epithelium differs from a malignant or cancerous epithelial tumor in (5)
   a. the number of the cells in the tumor.
   b. the type of cells (squamous, columnar, cuboidal) forming the tumor.
   c. the shape of the tumor.
   d. the ability of the tumor cells to cross the basal lamina.
   e. the organ where the tumor is found.
5. Chronic thyroiditis, commonly called Hashimoto's disease, is an autoimmune disease where one’s body produces antibodies against either thyroid peroxidase or thyroglobulin, decreasing the number and function of these molecules.

   A. Name the cells that make thyroid peroxidase and thyroglobulin. (2)

   B. Predict the blood levels of T3 and T4 in a patient diagnosed with Hashimoto's disease compared to a healthy individual. Briefly explain your prediction. (3)

   C. Predict the blood levels of TSH in a patient diagnosed with Hashimoto's disease compared to a healthy individual. Briefly explain your prediction. (3)

6. Compare the structure and function of ONE of the following: (8)

   a. Red Pulp and White Pulp
   b. Exocrine Pancreas and Endocrine Pancreas
7. CHOOSE ONE: EITHER A OR B. (15)

A. Draw a Classic Liver Lobule. Include and label in your drawing: portal triad, central vein, bile duct, bile cannaliculi, sinusoids, hepatocytes, hepatic artery, and portal vein. Use arrows to indicate the flow of bile and the flow of blood within the lobule.

B. Draw a Cross Section of a Lymph Node. Include and label in your drawing: capsule, cortex, paracortex, medulla, afferent and efferent lymph vessels, arterial and venous blood supply, and high endothelial venules, lymphatic nodule (follicle). Use arrows to indicate the pathway taken by a B lymphocyte as it enters the lymph node, encounters an antigen and is responds to it.
8. Many of us had the opportunity to be vaccinated this semester for the H1Ni virus. Briefly describe the process that occurred in an individual following the vaccination beginning with injection of H1Ni antigen into the body and ending with development of immunity. In your detailed description, include the participating cells and essential molecules. (10)
9. Complete the following table for **THREE** of the following protein hormones. (12)

<table>
<thead>
<tr>
<th>Hormone</th>
<th>Site of Production</th>
<th>Target Cells</th>
<th>Hormone Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cells stained with mRNA hormone probe</td>
<td>Cells stained with marker for hormone receptor</td>
<td></td>
</tr>
<tr>
<td>Cholecystokinin (CCK)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucagon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastrin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcitonin</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This histology class has been a visual experience; you have learned to interpret a tissue section for clues in order to identify an organ or tissue. The images can also be of interest to the general public. An entrepreneurial histologist launched a company transforming images of tissue sections into 500 piece puzzles. In the puzzle test room, groups of staffers were working on puzzles of organs that we covered this semester. At the end of a day of working puzzles, several puzzle pieces were found on the floor. You pick up the pieces and from their structure conclude that the stray pieces are of cells or structures listed on the left.

Your next task is to:

A. Identify an organ puzzle where each stray piece may belong.
B. Briefly describe a feature for each piece that helped you identify it such as structural features, staining characteristics, or molecular composition.

**CHOICE:** Choose FIVE of the following puzzle pieces. (15)

A. M cell
B. Ito Cell
C. Enterocyte
D. Parietal Cell
E. Kupffer cell
F. Podocyte
G. Chief cell
H. Pituicyte
I. Paneth cell
10. You have been provided with frozen sections of various rat organs and the antibodies listed below. Choose ONE antibody. For the antibody you choose, describe its staining pattern in THREE different organs. Be complete; you must describe all staining in organs for full credit! (12)

a. An antibody against connexin
b. An antibody against laminin
c. An antibody against actin