(10 pts.)
1. a. Explain how cholesterol regulates its own synthesis? Be sure to include both regulation of enzyme activity and enzyme synthesis.

b. Explain the molecular defect in the following genetic diseases:
   i) hypercholesterolemia

   ii) androgen insensitivity

(10 pts)
2. Explain using diagrams wherever possible, how the following hormones alter cellular metabolism.
   a. glucagon

   b. estrogen
3. Complete the following table describing metabolic pathways:

<table>
<thead>
<tr>
<th>Metabolic Pathway</th>
<th>pentose shunt</th>
<th>gluconeogenesis</th>
<th>Urea synthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main function in cells</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Substrate</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>End product</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Regulation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Location in cell</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>One tissue/organ the pathway is found in</strong></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
4. Show how the labelled carbons from C\textsuperscript{14} alanine would get into the following molecules in a human liver cell.

(5)a. glucose

(2)b. lactate

(3)c. proline

(5)d. phosphatidylcholine (lecithin)

5. In unusually stressful circumstances, human muscle glycogen may be broken down to glucose-6-P and eventually appear as glucose in the blood. Explain how the **carbons of glucose-6-P in muscle** could appear in blood glucose. Use diagrams where possible.
5. Describe how amino acids are transported into intestinal mucosal cells. **Use labelled diagrams wherever possible**

6. Describe the fate of **excess** amino acids in the human body.
7. Give the function of the following molecules in human metabolism.
   a. ubiquitin
   b. N-carboxy-biotin
   c. retinol

8. Explain how proline controls its own synthesis in the human cell.

9. The main precursors for the glucose made through gluconeogenesis are:
   a. lactate
   b. alanine
   c. acetyl CoA
   d. palmitate

10. A recent study showed that eating a meal very high in fats resulted in much less dilation of blood vessels immediately following the meal. Possible reasons for this phenomenon COULD be:
   a. high fat in the blood stream is known to lower cardiovascular disease significantly in all humans
   b. the fats in the blood stream somehow interfere with action of the hormone, NO
   c. the fatty acids were converted to glucose which prevented NO from being formed