**Know the following for exam 2**

Any information from last exam that is in the summaries or carbon skeleton of metabolism. Know how each of the new paths connects to the carbon skel.

**Pentose shunt pathway:**
- Main function, location, regulation substrate, endproduct
- Hereditary deficiency of first enzyme, G-6-P DHase-consequences

**Classes of lipids:**
- fatty acids, triglycerides, phosphoglycerides, steroids, sphingolipids
  - Importance of citrate shuttle
  - Fatty acid synthesis:
    - Main function, location, regulation substrate, endproduct
    - acetyl CoA carboxylase regulation
  - Triglyceride synthesis:
    - Main function, location, regulation substrate, endproduct
  - Hormonal control of lipid synthesis
    - effects of glucagon and insulin on adipose, muscle and liver

**The three main connections between lipid and carbohydrate metabolism**
- Phosphoglyceride synthesis:
  - Main function, location, regulation substrate, endproduct
  - importance of phosphatidate as key intermediate
- Sphingolipids:
  - sphingomyelin components

**Respiratory distress of newborn**

**Biological membranes: structure, function**
- lipid components, proteins: transport, hormone receptor, cellular recognition

**Cholesterol synthesis:**
- Main function, location, regulation substrate, endproduct
- Hormonal control of HMGCoA reductase; control of HMGCoA reductase activity and synthesis by cholesterol
- Hypercholesterolemia
- Bile acids, storage, importance in digestion

**Steroid hormones**
- mechanism of action; control of transcription and protein synthesis
- Androgen insensitivity

**Fat-soluble vitamins:**
- Retinal, retinol, rhodopsin, chemistry of vision; Retinoic acid
- Vitamin D-cholecalciferols
  - mechanism of action of vit. D;
  - stimulation of synthesis of Ca++ transport protein
- Vit. E - tocopherols, Vit. K - menadione
(10 pts)
Describe, in detail, how Vitamin D, cholecalciferol, stimulates the uptake of Ca++ into human cells.

(10 pts)
Explain, in detail, how a drop in blood glucose levels can stimulate the release of stored glucose into the blood stream.
(18 pts)
Complete the table below to describe each of the pathways indicated.

<table>
<thead>
<tr>
<th>Pathways</th>
<th>Fatty acid synthesis</th>
<th>Cholesterol synthesis</th>
<th>Pentose shunt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Main function

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Substrate

---

Endproduct

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Location in cell

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Regulation of key enzyme activity

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(5)
Match the letter corresponding to the correct cellular location to each of the metabolic pathways or metabolic processes shown below.

<table>
<thead>
<tr>
<th>Metabolic pathway</th>
<th>Location of pathway in cells</th>
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</thead>
<tbody>
<tr>
<td>_____ glucagon binding</td>
<td>A. cytoplasm</td>
</tr>
<tr>
<td>_____ glycogen synthesis path.</td>
<td>B. mitochondrion</td>
</tr>
<tr>
<td>_____ glycolysis</td>
<td>C. endoplasmic reticulum</td>
</tr>
<tr>
<td>_____ TCA cycle</td>
<td>D. cell membrane</td>
</tr>
<tr>
<td>_____ triglyceride synthesis path.</td>
<td>F. nucleus</td>
</tr>
</tbody>
</table>
(8 pts)
Describe, in detail, the mechanism of action of INSULIN binding to adipose cells and the overall effect on stored lipids. Use labelled diagrams wherever possible.

a. mechanism of action of insulin

b. effect of insulin on adipose cells

(10)
Describe the molecular defect for each of the inherited human diseases below.

a. hypercholesterolemia

b. androgen insensitivity
Match the letter corresponding to the correct cellular location for each of the metabolic pathways or metabolic processes shown below.

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</table>

Show the carbon skeleton of metabolism and how each of the lipid pathways are connected to it. Show the three intermediates in the carbon skeleton that are the main connectors to lipid paths.