

**Example: Learning objectives for content areas shown in the test blueprint**

Content area	Associated learning objectives
Introduction to metabolism	<ul style="list-style-type: none"> <li>• Describe an overview of the major catabolic pathways discussed in class.</li> <li>• List generalizations about metabolic pathways.</li> <li>• Identify regulatory reactions and describe the primary control mechanisms for the rates of these reactions.</li> <li>• Define a substrate cycle.</li> <li>• Explain the chemical reasons that ATP is a “high-energy” compound and how it functions as energy currency.</li> <li>• Recognize NAD<sup>+</sup> and FAD and explain how they function as energy currency.</li> </ul>
Glycolysis	<ul style="list-style-type: none"> <li>• Given a reaction, identify a type of enzyme that would catalyze the reaction (e.g., dehydrogenase, isomerase, etc.) and expected cofactor(s).</li> <li>• Identify any redox reactions or substrate-level phosphorylation reactions in glycolysis.</li> <li>• Analyze the effects of inhibitors based on their interference with enzyme mechanisms discussed in class.</li> <li>• Describe the purpose of fermentation and the specific steps of homolactic fermentation.</li> <li>• Describe the primary means of regulation for glycolysis, including the major allosteric regulators, their effect on enzyme structure, their effect on enzyme activity as represented graphically, and a physiologic rationale for their effects.</li> </ul>
Citric acid cycle	<ul style="list-style-type: none"> <li>• Describe the synthesis of acetyl-CoA, being able to draw the summary reaction, describe the five reactions catalyzed by the pyruvate dehydrogenase complex, and describe the function of and recognize the cofactors TPP, lipoamide, CoA, FAD, and NAD<sup>+</sup>.</li> <li>• Describe an overview of the citric acid cycle, including its general function, the starting components, the products, and the cofactors that are used.</li> <li>• Given a reaction from the citric acid cycle, be able to describe what is happening, name the enzyme, and identify required cofactors.</li> <li>• Describe the primary mechanisms for regulation of the pyruvate dehydrogenase complex and the three rate-limiting citric acid cycle enzymes and give a rationale for each of the regulators of these enzymes.</li> </ul>
Electron transport & oxidative phosphorylation	<ul style="list-style-type: none"> <li>• Describe the path of electron flow and proton transfer in the ETC.</li> <li>• Describe the mechanism by which ATP synthase couples a H<sup>+</sup> gradient to ATP synthesis.</li> <li>• Analyze the effects of inhibitors on O<sub>2</sub> consumption, NADH concentration, ATP production, H<sup>+</sup> gradient, other similar parameters, and the consequent effects on enzyme activity in the pathways we have discussed.</li> </ul>