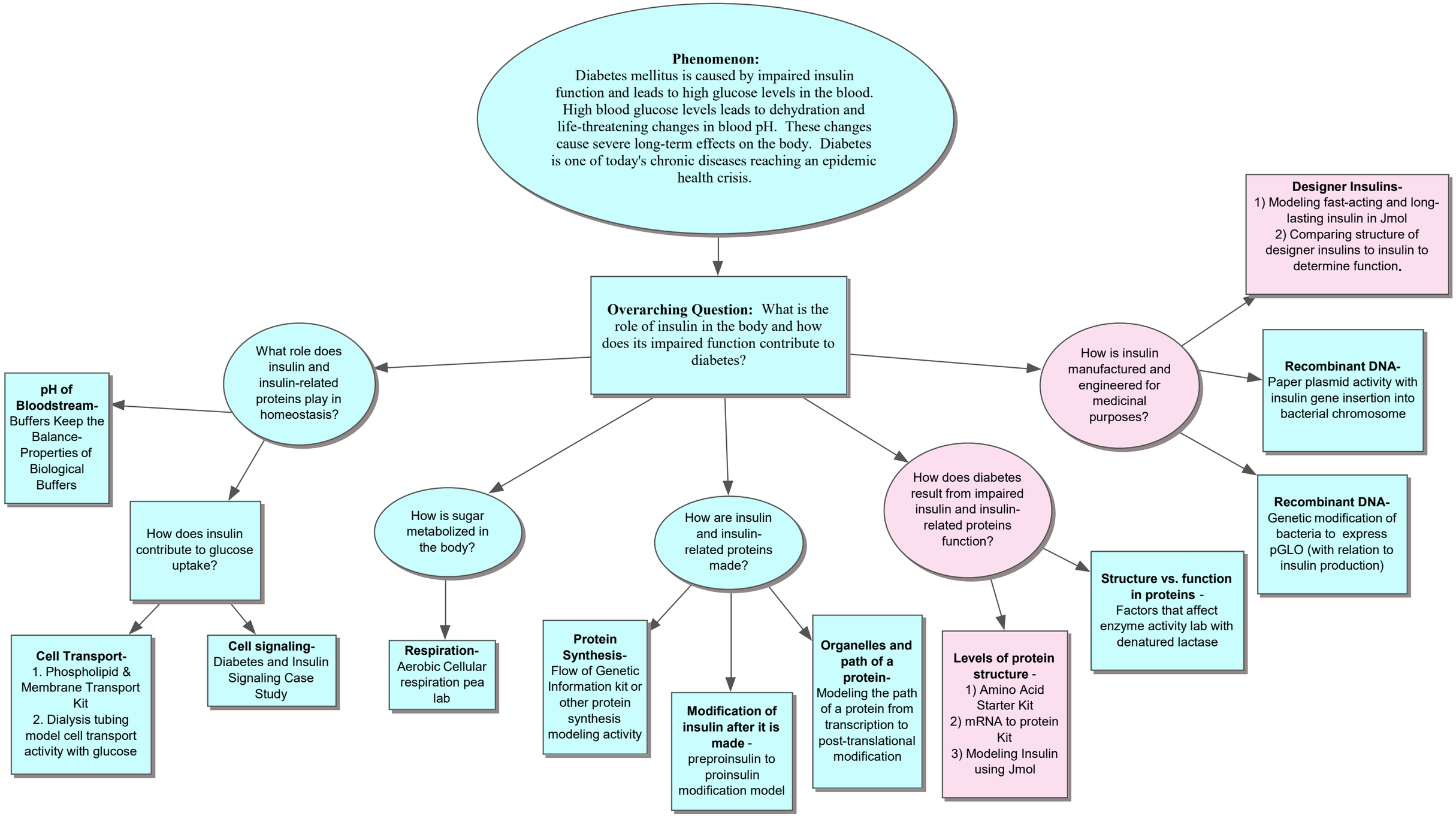
Phenomenon:
Diabetes mellitus is caused by impaired insulin function and leads to high glucose levels in the blood. High blood glucose levels leads to dehydration and life-threatening changes in blood pH. These changes cause severe long-term effects on the body. Diabetes is one of today's chronic diseases reaching an epidemic health crisis.
Overarching Question: What is the role of insulin in the body and how does its impaired function contribute to diabetes?
What role does insulin and insulin-related proteins play in homeostasis?
pH of Bloodstream- Buffers Keep the Balance- Properties of Biological Buffers
How does insulin contribute to glucose uptake?
Cell Transport- 1. Phospholipid & Membrane Transport Kit 2. Dialysis tubing model cell transport activity with glucose
Cell signaling- Diabetes and Insulin Signaling Case Study
How is sugar metabolized in the body?
Respiration- Aerobic Cellular respiration pea lab
How are insulin and insulin-related proteins made?
Protein Synthesis- Flow of Genetic Information kit or other protein synthesis modeling activity
Modification of insulin after it is made - preproinsulin to proinsulin modification model
Organelles and path of a protein- Modeling the path of a protein from transcription to post-translational modification
How does diabetes result from impaired insulin and insulin-related proteins function?
Levels of protein structure - 1) Amino Acid Starter Kit 2) mRNA to protein Kit 3) Modeling Insulin using Jmol
Structure vs. function in proteins - Factors that affect enzyme activity lab with denatured lactase
How is insulin manufactured and engineered for medicinal purposes?
Designer Insulins- 1) Modeling fast-acting and long-lasting insulin in Jmol 2) Comparing structure of designer insulins to insulin to determine function.
Recombinant DNA- Paper plasmid activity with insulin gene insertion into bacterial chromosome
Recombinant DNA- Genetic modification of bacteria to express pGLO (with relation to insulin production)