

This lecture by Prof. Dr. Samir Ali El-Masry covers enzyme chemistry, emphasizing their crucial role in life ("No enzyme...No Life"). Enzymes are defined as biological catalysts accelerating biochemical reactions without being consumed. Most are proteins; some are RNA-based ribozymes. They lower activation energy and exhibit specificity. Biomedically, enzymes are vital for metabolism, diagnosis (e.g., myocardial infarction detection via blood enzyme levels), and therapeutics (e.g., digestive enzymes). Enzyme characteristics include high efficiency at low concentrations, an active site for substrate binding, and dependence on primary to quaternary structures for activity. Molecular weight ranges from 12,000 to over one million Daltons; some require cofactors (inorganic ions or organic coenzymes) or both. Enzyme action involves an enzyme-substrate complex formation, often explained by the lock-and-key or induced-fit models. The active site, a cleft with functional groups and cofactors, facilitates substrate transformation into products. Enzymes are classified as simple (protein only) or complex (holoenzymes, comprising apoenzyme and cofactor – either coenzyme or prosthetic group). Zymogens are inactive enzyme precursors activated by pH changes or kinases. Isoenzymes, like lactate dehydrogenase (LDH), catalyze the same reaction but differ structurally and in properties. Finally, enzyme specificity varies, ranging from single substrate to bond type recognition.