**Topic 8.1 Metabolism**

**Essential Idea: Metabolic reactions are regulated in response to the cell’s needs.**

**Statements & Objectives:**

**8.1.U1 Metabolic pathways consist of chains and cycles of enzyme-catalyzed reactions.**

Contrast metabolic chain reaction pathways with cyclical reaction pathways.​

(**Contrast** Give an account of the differences between two (or more) items or situations, referring to both (all) of them throughout.)

**8.1.U2 Enzymes lower the activation energy of the chemical reactions that they catalyze.**

Define activation energy.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

Explain the role of enzymes in lowering the activation energy of a reaction.​

(**Explain** Give a detailed account including reasons or causes.)

**8.1.U3 Enzyme inhibitors can be competitive or non-competitive.**

Define enzyme inhibitor.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

Contrast competitive and noncompetitive enzyme inhibition.

(**Contrast** Give an account of the differences between two (or more) items or situations, referring to both (all) of them throughout.)

Outline one example of a competitive enzyme inhibitor and one example of a noncompetitive enzyme inhibitor. ​

(**Outline** Give a brief account or summary.)

**8.1.U4 Metabolic pathways can be controlled by end-product inhibition.**

Describe allosteric regulation of enzyme activity.

**(Describe**: Give a detailed account)

Outline the mechanism and benefit of end-product inhibition.

(**Outline** Give a brief account or summary.)

**8.1.A1 End-product inhibition of the pathway that converts threonine is isoleucine.**

Illustrate end-product inhibition of the threonine to isoleucine metabolic pathway.

State the consequence of an increase in isoleucine concentration.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

**8.1.A2 Use of databases to identify potential new anti-malarial drugs.**

Outline the reasons for development of new anti-malarial drugs.

(**Outline** Give a brief account or summary.)

Explain the use of databases in identification of potential new anti-malarial drugs.

(**Explain** Give a detailed account including reasons or causes.)

**8.1.S1 Distinguish different types of inhibition from graphs at specified substrate concentration.**

Explain why the rate of reaction with increasing substrate concentration is lower with a non-competitive inhibitor compared to a competitive inhibitor.

(**Explain** Give a detailed account including reasons or causes.)

**8.1.S2 Calculating and plotting rates of reaction from raw experimental results.**

State two methods for determining the rate of enzyme controlled reactions.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

State the unit for enzyme reaction rate.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

Given data, calculate and graph the rate of an enzyme catalyzed reaction.

(**Calculate** Obtain a numerical answer showing the relevant stages in the working.)

**8.1.NOS Developments in scientific research follow improvements in computing- developments in bioinformatics, such as the interrogation of databases have facilitated research into metabolic pathways.**

Outline the use and benefits of the bioinformatics technique of chemogenomics in development of new pharmaceutical drugs.

(**Outline** Give a brief account or summary.)

**Key Terms**

​metabolic chain reaction

​activation energy

​end-product inhibition

​malaria

​Krebs cycle

​cyclical reaction

​enzyme inhibitor

​allosteric regulation

​substrate concentration

​binding site

​activation energy

competitive inhibition

​threonine

​chemogenomics

​substrate

catalyze

​non-competitive ​inhibition

isoleucine

​Calvin cycle