SBI4U Exam Study Guide

Biochemistry:

1. Know the difference between hydrogen & covalent Bonds
2. Differentiate between polar and non-polar molecules.
3. Recognize the structures/functions of biochemical functional groups
4. Recognized the 4 macromolecules (Carbs, Lipids, Proteins, Nucleic Acids), their monomers and the bonds that hold them together.
5. Understand the functions of the 4 macromolecules as they apply to each of the other units (ex. enzymes in ETC, types of hormones, nucleic acids in protein synthesis, Na+/K+ pumps in action potentials…)
6. Recognize and state the characteristics of dehydration, oxidation, reduction, and hydrolysis reactions in biochemical molecules.
7. Explain how enzymes catalyze reactions via the Induced Fit Model
8. Explain the impact pH, temperature and concentrations have on enzyme activity.
9. Explain the Fluid Mosaic Model of the cell membrane, and the role different substances play in its function.
10. Describe the movement of substances along a concentration gradient.
11. Explain how water moves across a membrane through osmosis.
12. Define & apply terms such as isotonic, hypertonic and hypotonic.
13. Explain how active transport, coupled transport and endo-/exo-cytosis move substances across a membrane.

Metabolic Processes

1. Show how glucose is broken down to form ATP in cellular respiration, name the reactions, and where the various steps occur.
2. Explain how cellular respiration proceeds in the absence of oxygen.
3. Explain how proteins and lipids can be used to generate ATP.
4. List the structures involved in photosynthesis and how chlorophyll contributes to the process.
5. Explain where the different stages (*dark & light reactions*) of photosynthesis occur and what happens in each reaction to turn CO_2 into glucose.
6. Explain the different methods of photosynthesis (C3, C4, CAM), and the advantages/disadvantages to each.
7. Know the role of enzymes in biochemical reactions (*eg. RUBISCO*) and how they catalyze chemical reactions.

Homeostasis:

1. Explain, with examples, the difference between negative and positive feedback, how they maintain homeostasis and why this is important.
2. Explain how different hormones can affect growth, metabolism, response to stress and blood sugar levels.
3. Know the parts of the nephron and how they relate to the 3 key stages of urine formation (filtration, absorption & secretion).
4. Explain how the kidney helps maintain water and salt balance in the body and which hormones are used to regulate the processes.
5. Explain how protein and steroid hormones function differently.
6. Know the different parts of a neuron and the functions of each.
7. Describe how signals are transmitted through the nervous systems (action potentials, synapses, neurotransmitters, reflexes, etc).
8. Know how the nervous system is organized into different regions with different responsibilities.
9. Know how the brain is organized into different regions with different responsibilities.

Molecular Genetics

1. Know the structure of DNA, how the different subunits piece together, and how the double helix is held together.
2. Outline the steps in DNA replication using proper terms and enzymes
3. Describe the link between DNA, RNA, and proteins.
4. Explain the processes of transcription & translation, including enzymes, key molecules, and modifications, that leads to a piece of DNA becoming a functioning protein.
5. Take a strand of DNA and get a polypeptide sequence from it.
6. Explain how different types of mutations can alter an amino acid sequence of a protein and their effects.