Section 1

- Metabolism (from the Greek: metabole, change) is an emergent property of life that crises from interactions between molecules within the orderly environment of the cell.
- Metabolic pathway- begins with a specific molecule, which is then altered in series of defined steps, resulting in a certain product
- These degradative processes are called catabolic pathways, or breakdown pathways.
- Anabolic pathway, in contrast, consume energy to build complicated molecules from simpler ones; biosynthetic pathways.
- Bioenergetics - the study of how organisms manage their energy resources
- Energy- is the capacity to cause change
- Energy can be associated with the relative motion of object, this energy is called kinetic energy
- Heat, or thermal energy, is kinetic energy associated with the random, movement of atoms or molecules
- An object not presently moving may still possess energy. Energy that is not kinetic is called potential energy, it is energy that matter possesses because of its location or structure.
- Chemical energy is a term used by biologists to refer to the potential energy available for release in a chemical reaction.
- Thermodynamics- the study of the energy transformations that occur in a collection of matter
  - Closed systems
  - Open systems
- First law of thermodynamic - energy can be transferred and transformed, but it can not be created nor destroyed
- Second law of thermodynamic- every energy transfer or transformation increase the disorder (entropy) of the universe.

Section 2

- Free energy measures the portion of a system's energy that can perform work when temperature and pressure are uniform throughout the system, as in a living cell.
  - $\Delta G = \Delta H - T \Delta S$
    - ΔG: Free energy
    - ΔH: Symbolizes the change in the system's enthalpy
    - ΔS: Is the change in the system's entropy
    - T: Is the absolute temperature in Kelvin (K). K= C + 273
  - $\Delta G = G_{\text{final state}} - G_{\text{Initial state}}$
- Exergonic reaction- proceeds with a net release of free energy