

Chapter 4: Energy and Cellular Metabolism

- Energy in biological systems
- Chemical reactions
- Enzymes
- Metabolism

Properties of Living Organisms

Properties of Living Organisms	Table 4.1
1. Have a complex structure whose basic unit of organization is the cell	
2. Acquire, transform, store, and use energy	
3. Sense and respond to internal and external environments	
4. Maintain homeostasis through internal control systems with feedback	
5. Store, use, and transmit information	
6. Reproduce, develop, grow, and die	
7. Have emergent properties that cannot be predicted from the simple sum of the parts	
8. Individuals adapt and species evolve	



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Energy is required for many, if not all (indirectly) processes important for life.

Energy: Capacity to Do Work

- Chemical work
 - Making and breaking of chemical bonds
- Transport work
 - Moving ions, molecules, and larger particles
 - Useful for creating concentration gradients
- Mechanical work
 - Moving organelles, changing cell shape, beating flagella and cilia
 - Contracting muscles