

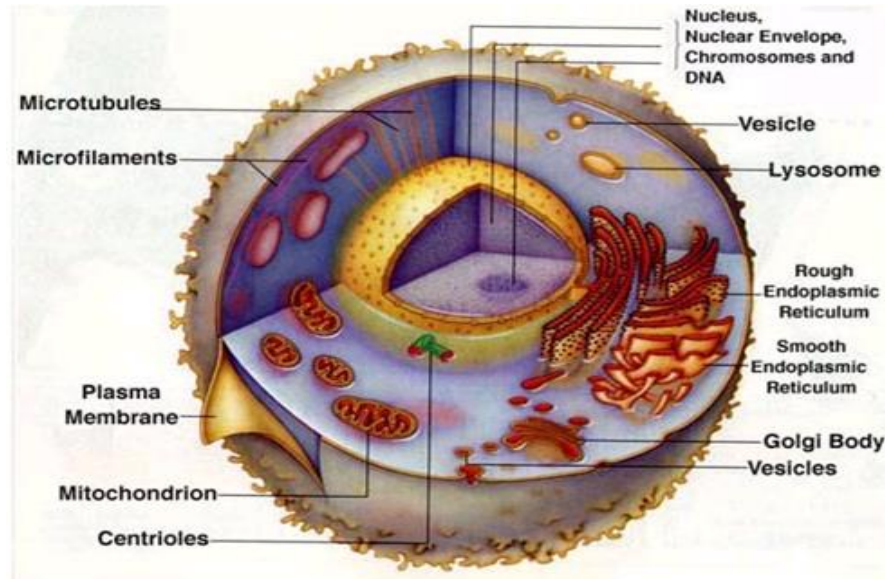
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Topic 3.3 – Nutrition & Energy Systems

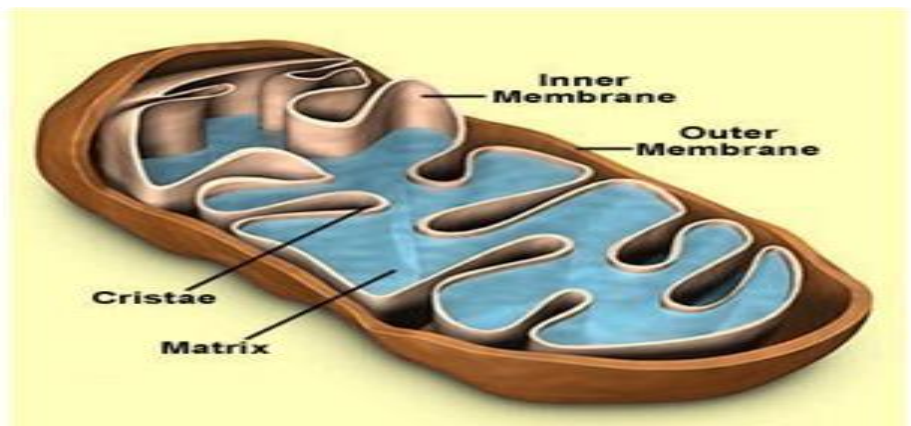
IB SEHS

**3.3.1 Draw a diagram to show the ultrastructure of a generalized animal cell.**



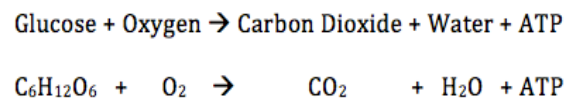
**3.3.2 Draw a diagram to show the ultrastructure of a mitochondrion.**

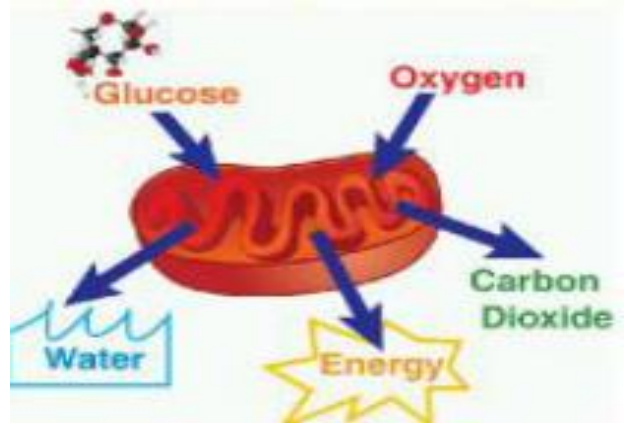
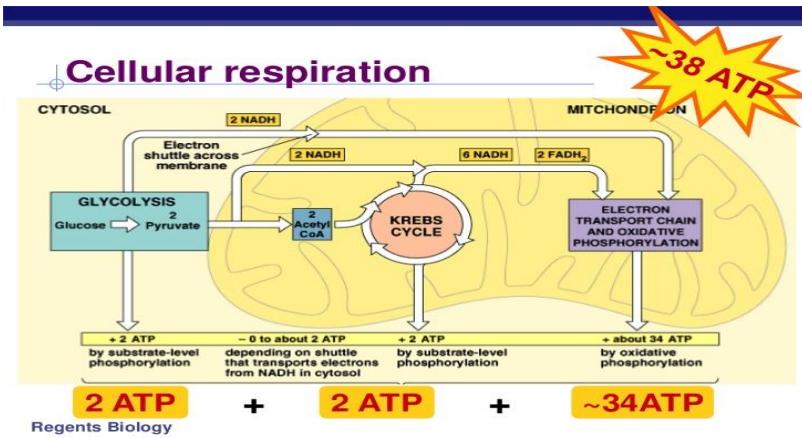
- Mitochondria are \_\_\_\_\_-enclosed [organelles](#) distributed through the cytosol of cells.
- Their number within the cell ranges from a few \_\_\_\_\_ to, in very active cells, thousands.
- Their main function is the conversion of the \_\_\_\_\_ energy of food molecules into ATP. Mitochondria have: an outer membrane that encloses the entire structure
- an inner \_\_\_\_\_ that encloses a fluid-filled matrix
- between the \_\_\_\_\_ is the intermembrane space



**3.3.3. Define the term cell respiration**

- Cell \_\_\_\_\_ is defined as the controlled release of energy in the form of ATP from organic compound in cells.
  - ATP is a chemical compound that provides energy for muscle \_\_\_\_\_. Cellular respiration can also be fueled by \_\_\_\_\_, fats and proteins. These are all macronutrients.
- There are two types of respiration: aerobic respiration, and anaerobic respiration.
  - \_\_\_\_\_ respiration results in **MORE** energy for cell use. It also **NEEDS** the presence of oxygen.
  - \_\_\_\_\_ respiration results in **LESS** energy for cell use. This happens in **LOW** or **ABSENCE** of oxygen.
- Any movement made by the body requires a series of \_\_\_\_\_ muscle contractions, which requires energy. For movement to happen, the body \_\_\_\_\_ stored chemical energy to mechanical energy.
  - Adenine \_\_\_\_\_ needs to be broken down to meet the chemical energy requirement.

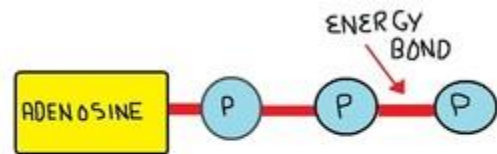




- We can divide cellular respiration into \_\_\_\_\_ metabolic processes: \_\_\_\_\_, the Krebs cycle, and oxidative phosphorylation. Each of these occurs in a specific region of the cell.
  - Glycolysis occurs in the \_\_\_\_\_. In the absence of oxygen, glycolysis occurs in the cytosol as well.
  - The Krebs cycle takes place in the \_\_\_\_\_ of the mitochondria.
  - Oxidative \_\_\_\_\_ via the electron transport chain is carried out on the inner mitochondrial membrane.
    - the metabolic pathway in which cells use enzymes to \_\_\_\_\_ nutrients, thereby releasing energy which is used to reform ATP. In most eukaryotes, this takes place inside mitochondria.

### 3.3.4 Explain how adenosine can gain and lose a phosphate molecule.

- ATP consists of one \_\_\_\_\_ of adenosine and three molecules of phosphate.
- Energy is released from ATP by the \_\_\_\_\_ of the bonds that hold the molecules together.
- The adenosine triphosphate (ATP) molecule stores \_\_\_\_\_ when it is not needed, but is able to release it when the body needs it.
- ATP works by losing the endmost \_\_\_\_\_ group when told to do so by an enzyme. This releases a lot of energy, which can then be used to build \_\_\_\_\_, contract muscles, etc.
  - The end product is adenosine \_\_\_\_\_ (ADP), and a phosphate molecule.
  - Additional energy can be \_\_\_\_\_ by removing a second phosphate group to produce adenosine-monophosphate (AMP) (**RARE**).
- When the body is resting and energy is not \_\_\_\_\_ needed, the \_\_\_\_\_ reaction takes place and the phosphate group is reattached to the molecule using energy obtained from food.



### 3.3.5 Explain the role of ATP in muscle contraction

- ATP provides \_\_\_\_\_ amount of energy for muscle contraction. 2 \_\_\_\_\_ supply of energy
  - ATP breaks down the \_\_\_\_\_-actin cross-bridge, freeing the myosin for the next contraction
    - First, ATP binds to myosin, breaking down an actin-myosin bridge and causing muscle \_\_\_\_\_ to stop.

- ii. The free myosin and its bridge then move to a point where they can attach to actin. At this point, ATP is broken down into \_\_\_\_\_ diphosphate and P (inorganic phosphate), generating energy.
- iii. ADP (adenine diphosphate), P and the \_\_\_\_\_ bridge then attach to actin, causing muscle contraction.
- iv. During the muscle \_\_\_\_\_ phase, actin displaces ADP and P at the myosin cross bridge. ADP and P are then reconstituted into ATP by the body, and the \_\_\_\_\_ starts again.
  1. \_\_\_\_\_ contraction also requires the brain, the nervous system and other body systems to \_\_\_\_\_ properly.