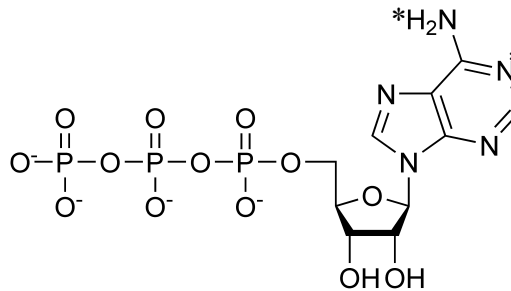


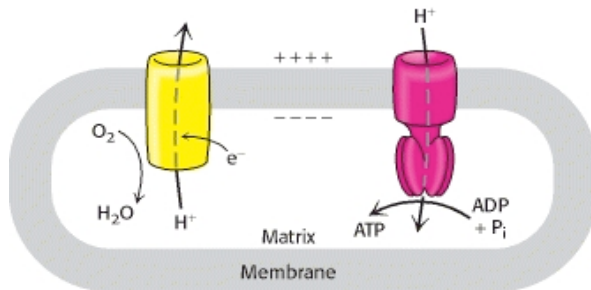
Solution key - 7.012 Recitation 3 - 2010

Questions:

1. This is a diagram of ATP



- Draw a line to show which bond that is broken when this molecule is used as an energy source.
 - Star * the **atom(s)** that can form a hydrogen bond with the complementary base.
2. A representation of the mitochondrion is shown below.



- When glucose is metabolized, some of the energy is captured in the formation of reduced NAD (NADH + H⁺). What is the fate of NADH in mitochondria?

The NADH donates its electron to the electron transport chain and gets oxidized to NAD⁺. The energy released by the oxidation of each NADH molecule is used towards making 3ATP.

- If aerobic respiration is occurring in this cell, O₂ is consumed. What is the role of O₂ in this cell? What is produced from the O₂?

It being highly electronegative serves as the final electron acceptor and produces water as the final end product of a series of oxidation-reduction reactions that occur in the inner mitochondrial membrane and together comprise oxidative phosphorylation.

- If aerobic respiration is occurring in this cell, CO₂ is released. What is the source of this C O₂? What is the ATP that is generated used for?

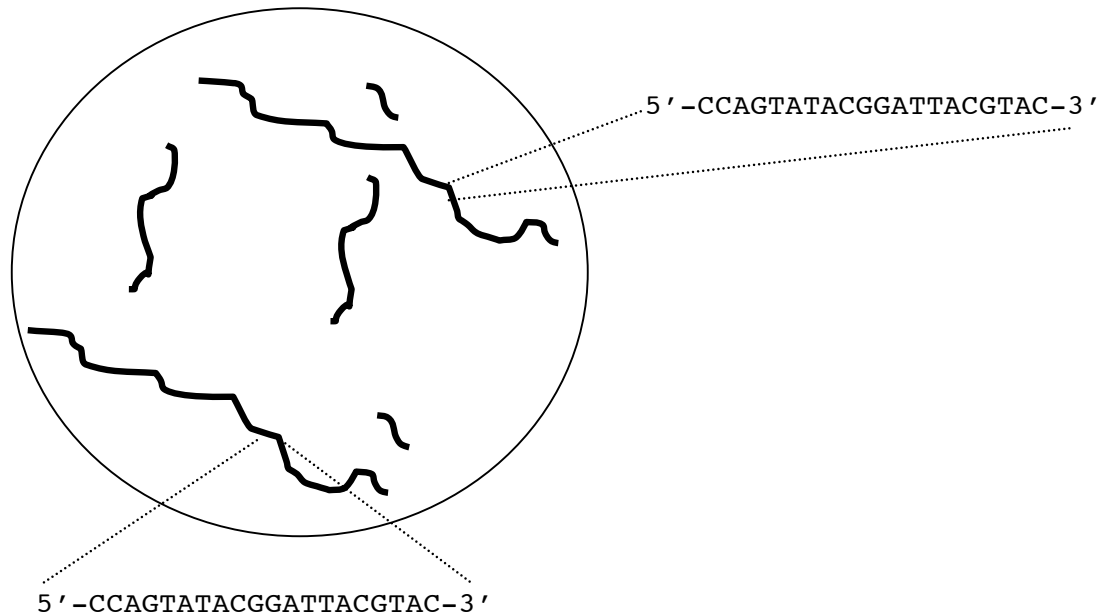
Pyruvate that is produced from glucose during glycolysis, is the source. The ATP generated serves as the energy currency of the cell.

3. Below is pictured the nucleus from a skin cell taken from a mouse (named Mouse #1), with the chromosomes shown in bold.

- Is the cell haploid or diploid? Why did you answer the way that you did?

It is diploid since the chromosomes are present in pairs.

Let's say we blew up a region of the longest chromosome to look at its sequence at one small gene.



ii. Is Mouse #1 homozygous or heterozygous at this gene?

It is homozygous since the sequence on the two homologous chromosomes provided in the schematic above is identical.

Now we zoom in on the same exact gene on the long chromosome in a cell from a mouse named Mouse #2 and find that its two homologous chromosomes have the sequences:

5'-CCAGTATACGGAGTACGTAC-3'
Sequence 1

5'-CCAGTATACGGATTACGTAC-3'
Sequence 2

iii. How might we write the genotypes of Mouse #1 and Mouse #2 if Sequence #1 encodes a functional protein but Sequence #2 encodes a protein that no longer works? (Note: Use the upper case or lowercase A while writing the genotypes).

Mouse #1 = aa

Mouse #2: Aa

4. Consider a hummingbird in which the body color is controlled by the B gene. These hummingbirds are either green or yellow, where green color is dominant to yellow color. Give the expected ratio (both phenotypes and genotypes) of the offspring for the following crosses.

			Genotypic ratio	Phenotypic ratio
Cross 1:	BB x BB	Offspring:	BB	All green
Cross 2:	bb x bb	Offspring:	bb	All yellow
Cross 3:	Bb X Bb	Offspring:	1BB: 2Bb: 1bb	3 Green : 1 Yellow
Cross 4:	Bb X bb	Offspring:	1Bb : 1bb	Green : Yellow