TIME Instructional Resources

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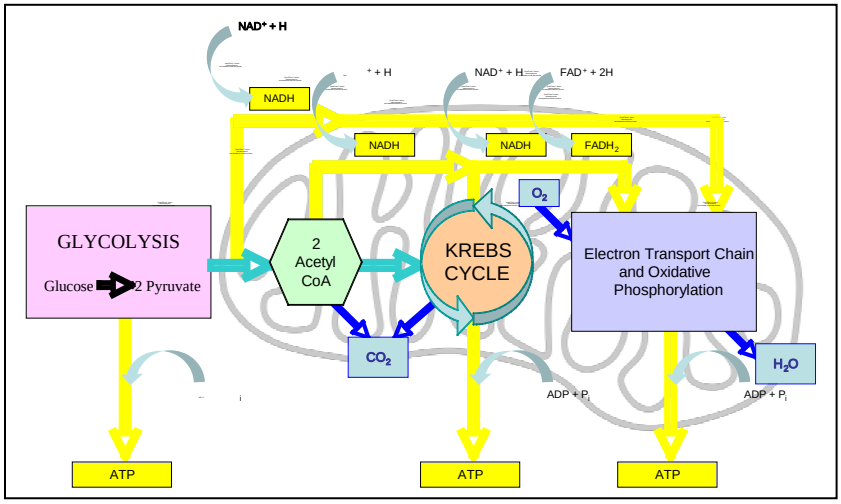
TIME – Cellular Respiration

Following matter

This diagram has labeled arrows that reflect various inputs and outputs of the processes of cellular respiration. Match the molecule to its role in cellular respiration.



1. glucose – $C_6H_{12}O_6$
2. H_2O
3. CO_2
4. pyruvate – $C_3H_3O_3$
5. O_2
6. acetyl CoA

ANSWERS:

1. input to glycolysis
2. output of ETC
3. output of Krebs cycle
4. output of glycolysis
5. output of ETC
6. input to Krebs cycle

TIME – Cellular Respiration

Following the flow of matter

Use what you know about the reactants and products of each of the processes of cellular respiration to determine whether each of the following statements is true of false.

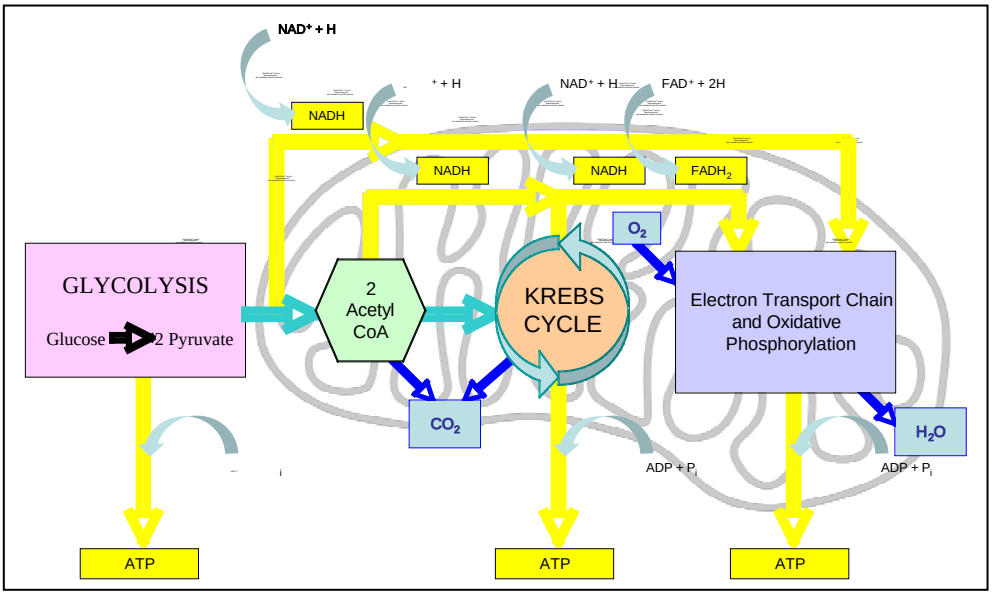
A. CO_2 is a reactant of the Electron Transport Chain
B. NAD^+ and ADP are reactants of the Krebs Cycle.
C. NAD^+ and ADP are reactants of glycolysis.
D. Pyruvate is a reactant and CO_2 is a product of acetyl CoA production.
E. Acetyl CoA production, the Krebs Cycle, and the Electron Transport Chain all take place in the matrix of the mitochondria.
F. Glucose is a reactant and CO_2 is a product of glycolysis.
G. During glycolysis, a 6-carbon sugar is converted to two 3-carbon sugars.
H. During glycolysis, some of the carbon in glucose is converted into energy.
I. During production of acetyl CoA, a 3-carbon molecule is produced from a different 3-carbon molecule.
J. During acetyl CoA production some of the carbon in pyruvate is converted to energy.
K. NAD+ and ADP are reactants of acetyl CoA production.
L. Acetyl CoA is a reactant and CO_2 is a product of the Krebs Cycle.
M. A 2-carbon molecule is a reactant and a single-carbon molecule are products of the Krebs Cycle.
N. During the Krebs Cycle, some of the carbon in acetyl CoA is converted to energy.
O. NADH and FADH2 are reactants in the Electron Transport Chain.
P. In the Electron Transport Chain, some of the carbon in NADH is converted to energy.
Q. Glycolysis takes place in the cytosol.
R. All of cellular respiration takes place within mitochondria.

ANSWERS:

A. False
B. True
C. True
D. True
E. False
F. False
G. True
H. False
I. False
J. False
K. True
L. True
M. True
N. False
O. True
P. False
Q. True
R. False

Cellular Respiration

Matching molecules to role in CR



Cellular respiration consists of processes that involve two general categories of molecules: 1) those that are inputs and/or outputs of cellular respiration; 2) those that are involved in the shuffling of chemical potential energy, which we call energy management molecules.

Match the role of the molecules to the molecules themselves.

A input/output
B energy management molecules

A pyruvate
A acetyl CoA
A glucose
B FAD
B NADH
B ADP
B NAD+
A fats
B ATP
B FADH2

Cellular Respiration

Using other molecules

Organisms don't consume only glucose. They consume lots of kinds molecules, which are broken down by digestion and then distributed to cells for both growth and metabolism. How are these other molecules used in cellular respiration?

Indicate whether each of the following statements is true or false.

Hint: The two general rules about respiration and energy are:
1) molecules with C-C and C-H bonds have more chemical potential energy than those with C-O bonds;
2) reduced forms of a molecule have more chemical potential energy than oxidized forms.

concept = proteins

False When we eat protein, their amino acids are converted to 6-carbon sugars before being used in cellular respiration.

False All atoms in sugars, amino acids, glycerol and fatty acids can be used in one of the sets of reactions of cellular respiration.

True Proteins must be broken down to amino acids, which can enter cellular respiration reactions.

concept = CO2 release

True Most of the carbon in food that we oxidize to gain chemical potential energy is given of as CO2.

False We do not gain weight from the food utilized in cellular respiration because it is converted to energy.

True We do not gain weight from the food utilized in cellular respiration because it is expelled as carbon dioxide and water.

concept = Three

True We get chemical potential energy from macromolecules that can be broken down to basic building blocks.

True Macromolecules from food that cannot be broken down to basic building blocks cannot be used in cellular respiration.

concept = fats

False Sugars yield more chemical potential energy than fats, because they go through all of the reactions of cellular respiration.

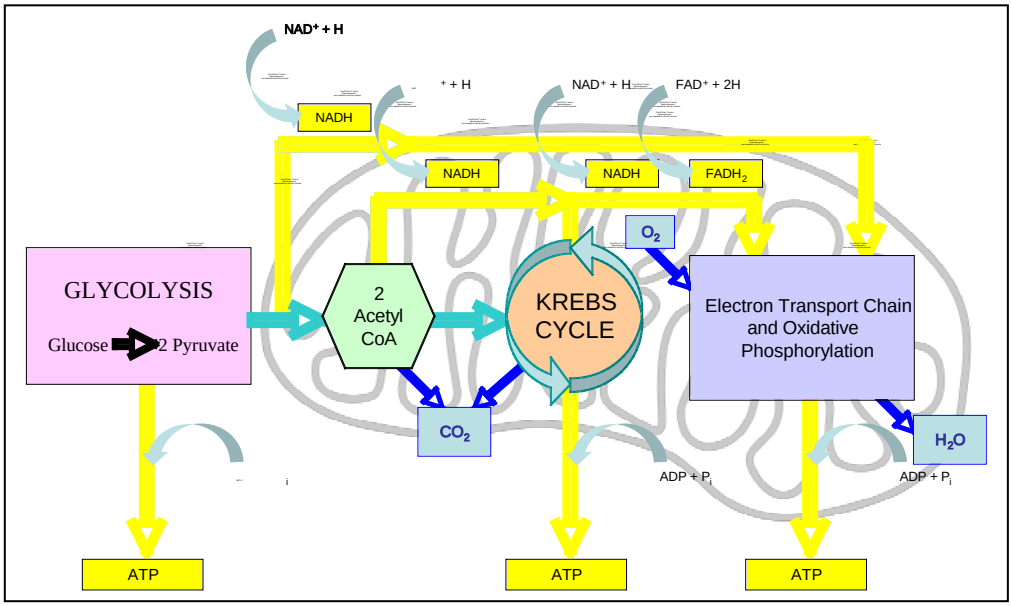
False The general formula for sugars is $(CH_2O)_n$. The general formula for fatty acids is $(CH_2)_n$. Sugars yield more chemical potential energy per gram than fats, because the carbon is already partially oxidized.

True The general formula for sugars is $(CH_2O)_n$. The general formula for fatty acids is $(CH_2)_n$. Fats yield more chemical potential energy per gram than fats, because the carbon is fully reduced.

True The general formula for sugars is $(CH_2O)_n$. The general formula for fatty acids is $(CH_2)_n$. Fats yield more chemical potential energy per gram than sugars because their C-bonds.

Cellular Respiration

Pyruvate to acetyl Coenzyme A



In eukaryotic aerobic organisms, pyruvate is transported into the mitochondria. Once inside, an important preliminary reaction takes place prior to the start of the Krebs cycle, the production of acetyl-Coenzyme A.

Hint: The two general rules about respiration and energy are:

1) molecules with C-C and C-H bonds have more chemical potential energy than those with C-O bonds;
2) reduced forms of a molecule have more chemical potential energy than oxidized forms.

Indicate whether each of the following statements is true or false.

concept = matter

True Carbon dioxide is produced which diffuses out of the mitochondrion and eventually leaves the organism.
False An atom of carbon is transferred from pyruvate to NAD+.
True An atom of hydrogen is transferred from pyruvate to NAD+.

concept = redox

False Carbon is reduced while acetyl CoA is oxidized.
True Carbon is oxidized while NAD+ is reduced.
True Carbon is oxidized while NAD+ is reduced.

concept = energy

False Some of the chemical potential energy in pyruvate is transferred to carbon dioxide.

True Some of the potential energy in pyruvate is transferred to NADH.

False Acetyl CoA and carbon dioxide are both small molecules with very little chemical potential energy.

concept = energy 2

False A molecule of ATP is produced as a result of the partial oxidation of pyruvate.

True The energy management molecule NADH is produced as a result of the partial oxidation of pyruvate.