

## Metabolism

### Read Chapter 4.1-4.4

#### Fill in the blanks

1. Organisms from every kingdom use \_\_\_\_\_ as energy.
2. Energy is transferred from ATP when the last \_\_\_\_\_ bond is broken, converting ATP into \_\_\_\_\_.
3. Macromolecules in our diet such as proteins, \_\_\_\_\_, and \_\_\_\_\_ are broken down into chemical energy through the process of \_\_\_\_\_.
4. Carbohydrates contain \_\_\_\_\_ Calories per gram.
5. Fats contain \_\_\_\_\_ Calories per gram.
6. Protein contains \_\_\_\_\_ Calories per gram.
7. Alcohol contains \_\_\_\_\_ Calories per gram.
8. 1 pound (0.45kg) is equal to \_\_\_\_\_ Calories.
9. In oxidation-reduction reactions, electrons are moved from one molecule to another. When electrons move from glucose it is \_\_\_\_\_ and when NAD gains electrons, it is \_\_\_\_\_.
10. Production of ATP through oxidative phosphorylation in the presence of oxygen is \_\_\_\_\_ respiration and ATP produced without oxygen is \_\_\_\_\_ respiration.

#### Glycolysis

11. Glycolysis occurs in the \_\_\_\_\_.
12. The chemical formula for glucose is \_\_\_\_\_.
13. Through the process of glycolysis, glucose is split into two 3-carbon molecules called \_\_\_\_\_.
14. In order for glycolysis to begin, \_\_\_\_\_ # of ATP molecules are required.
15. By the end of glycolysis, \_\_\_\_\_ # of NADH molecules are formed.
16. By the end of glycolysis, a *total* of \_\_\_\_\_ # of ATP molecules are formed; a *net* amount of \_\_\_\_\_ # ATP.
17. During glycolysis, ATP is produced through a process called \_\_\_\_\_.

#### Pyruvate oxidation and the Krebs cycle

18. The 2 pyruvate molecules formed during glycolysis move from the \_\_\_\_\_ into the \_\_\_\_\_.
19. Pyruvate oxidation involves the movement of electrons from \_\_\_\_\_ to \_\_\_\_\_.
20. During pyruvate oxidation, a carbon is removed from each pyruvate molecule by an enzyme called \_\_\_\_\_ and a molecule of \_\_\_\_\_ is formed through a process called \_\_\_\_\_.
21. \_\_\_\_\_ cells require the most ATP, which is why \_\_\_\_\_ is the primary way to burn excess Calories.
22. During periods of time when we do not need a large amount of ATP, excess glucose will be converted into \_\_\_\_\_ to be stored. When fats are used as energy, they do not go through glycolysis, they go through a process called \_\_\_\_\_ and enter the cellular respiration process at the \_\_\_\_\_ stage.

### **Krebs cycle**

23. For each glucose molecule that began the process, \_\_\_\_\_ # of acetyl-CoA molecules are formed.
24. Krebs cycle occurs in the \_\_\_\_\_
25. For each single acetyl-CoA that enters the Krebs cycle, how many of each of the following are produced?
- ATP \_\_\_\_\_
  - CO<sub>2</sub> \_\_\_\_\_
  - NADH \_\_\_\_\_
  - FADH<sub>2</sub> \_\_\_\_\_
26. The most important end product of the Krebs cycle is the \_\_\_\_\_ and \_\_\_\_\_ because they will bring \_\_\_\_\_ to the electron transport chain where many ATP molecules can be produced.

### **Electron Transport Chain**

27. How many total NADH molecules were formed from glycolysis, pyruvate oxidation, and the Krebs cycle that will enter the electron transport chain? \_\_\_\_\_
28. \_\_\_\_\_ are membrane proteins found in the inner mitochondrial membrane that pump hydrogen ions (protons) in the \_\_\_\_\_.
29. The proton gradient is used as energy for the production of \_\_\_\_\_.
30. The H<sup>+</sup> move from the intermembrane space back into the \_\_\_\_\_ and move through a special protein called \_\_\_\_\_.

31. \_\_\_\_\_ is the term used to describe the process of using a chemical gradient (protons) to produce ATP.
32. As protons are pumped across the membrane, electrons move through the \_\_\_\_\_ proteins.
33. The movement of protons across the membrane is \_\_\_\_\_ transport because the protons are moving against their concentration gradient.
34. At the end of the electron transport chain, the electrons combine with a molecule of \_\_\_\_\_ and form a \_\_\_\_\_ molecule.
35. The total number of ATP molecules formed during the entire process of cellular respiration when starting with a glucose molecule is approximately \_\_\_\_\_.
36. Would more ATP be made from glucose or a fatty acid? \_\_\_\_\_.