

**SOLUTIONS TO THE STUDY GUIDE FOR MODULE #12**

1. a. Producers – Organisms that produce their own food
  - b. Consumers – Organisms that eat living producers and/or other consumers for food
  - c. Herbivore – A consumer that eats producers exclusively
  - d. Carnivore – A consumer that eats only other consumers
  - e. Omnivore – A consumer that eats both producers and other consumers
  - f. Basal metabolic rate – The minimum amount of energy required by the body in a day
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2. The energy in most living organisms originates in the sun.
  3. a. A mushroom is in kingdom Fungi and is therefore a decomposer.
  - b. An evergreen bush is a plant and is therefore a producer.
  - c. A worm eats other things (it is certainly not a plant!), thus it is a consumer.
  - d. In Module #10, you learned that algae are the most important source of photosynthesis on the planet. Thus, they are producers.
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4. Food is converted to energy via the process of combustion.
  5. Combustion requires oxygen, as well as something to burn, such as wood or monosaccharides.
  6. Combustion produces energy, carbon dioxide, and water.
  7. The three macronutrients are carbohydrates, fats, and proteins.
  8. The main thing that the macronutrients provide is energy.
  9. We need to eat a lot more macronutrients.
  10. Disaccharides are made of two monosaccharides linked together, while polysaccharides are made of *several* monosaccharides linked together. Thus, a polysaccharide is the largest.
  11. Glucose is a monosaccharide. Most carbohydrates contain a lot of glucose.
  12. Fats come in two types: saturated fats and unsaturated fats. You can distinguish them by looking at them while they are at room temperature. Saturated fats are usually solid at room temperature, while unsaturated fats are usually liquid.
  13. Proteins are made of long strings of amino acids.

14. The body prefers to burn carbohydrates, then fats, and then proteins (or amino acids).
15. If your cells do not have enough amino acids, the amino acids from the proteins you eat are sent to your cells so that your cells can make the proteins they need. If your cells have plenty of amino acids, the amino acids from the proteins you eat are either burned for energy or converted into carbohydrates or fats.
16. Your cells must make proteins by linking together amino acids. There are several amino acids your body cannot make. Thus, you must get them from food. Without those amino acids, your cells will not be able to make the proteins they need to make. Animal proteins have these amino acids in plentiful supply. Plant proteins rarely have all of them. Thus, people who eat only plants must get a wide variety of plant proteins to make sure they get those amino acids.
17. Endothermic animals have higher BMRs. The BMR tracks the minimum amount of energy needed to survive. Both endothermic and ectothermic animals have involuntary muscles, etc., that need energy, but only endothermic animals expend energy to keep their internal temperatures high.
18. Ectothermic animals cannot be active on very cold days. Since their body temperatures are not held constant, the colder days reduce the speed at which the chemical reactions can occur in their bodies. This makes them sluggish.
19. Calories are a measure of energy. They can be used to measure how much energy is in food, or how much energy is expended by a living organism.
20. The second man is less active during the day. Since they both burn about the same number of calories while sleeping, they both have essentially the same BMR. Remember, BMR is the minimum amount of energy you need. The amount of energy you burn when you sleep is minimal. If the first needs more calories, he must be burning more energy during the day, when both men are active.
21. No, you cannot. It might be that Jean's BMR is simply much higher than Wanda's. They can each be very active, but their BMR is a major factor in determining how much food they need.
22. In general, the smaller the mammal the higher the normalized BMR, because the more energy the animal has to spend keeping its internal temperature high. Thus, the mouse has the higher normalized BMR.
23. Combustion of food takes place in the cell.
24. The mitochondrion is called the "powerhouse" of the cell because the majority of energy in the combustion process is released in step 3, which takes place in the mitochondrion.
25. The combustion of food takes place in three basic steps. This allows for a gentle release of energy so that the cell doesn't burn up from the combustion process.