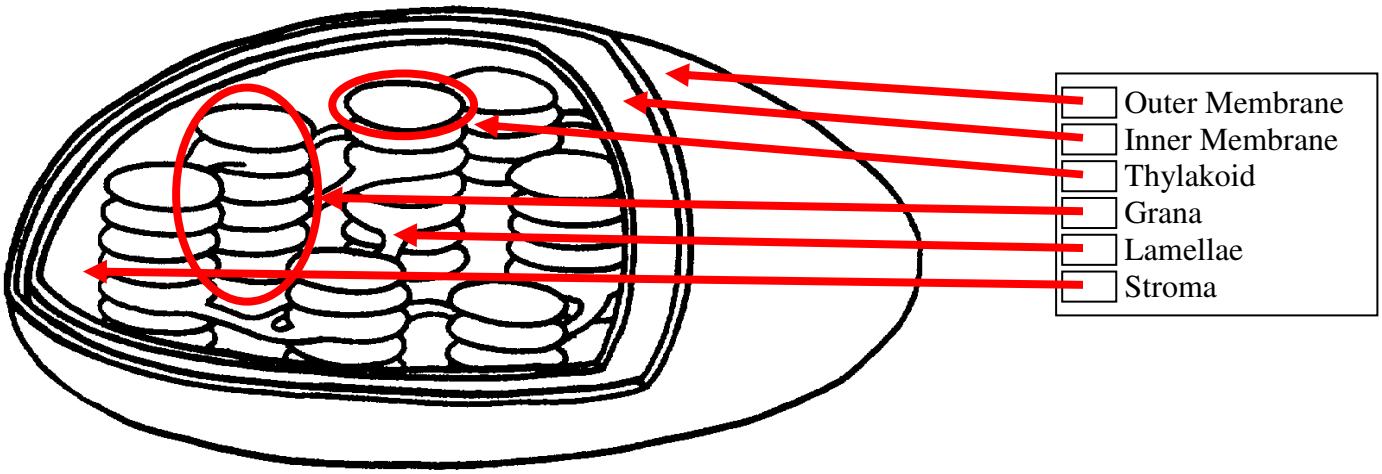
Name: Period: Date:

Topic 3: Cell Structures

Chloroplasts are double membrane organelles with a smooth outer membrane and an inner membrane folded into disc-shaped sacs called **thylakoids**. Thylakoids, containing chlorophyll and other **accessory pigments (red, orange, yellow, brown)**, are in stacks called **granum** (**grana**, plural). Grana are connected to each other by structures called **lamellae**, and they are surrounded by a gel-like material called **stroma.** ***Color and label*** the parts of a chloroplast in figure 1.

FIGURE 1-CHLOROPLAST



1. How many membranes surround a chloroplast? two

2. The outer membrane is Smooth

3. The INDIVIDUAL SACS formed by the inner membrane are called thylakoids and are arranged in stacks like pancakes.

4. What pigment is found inside a thylakoid? What color will it be?
   chlorophyll; green

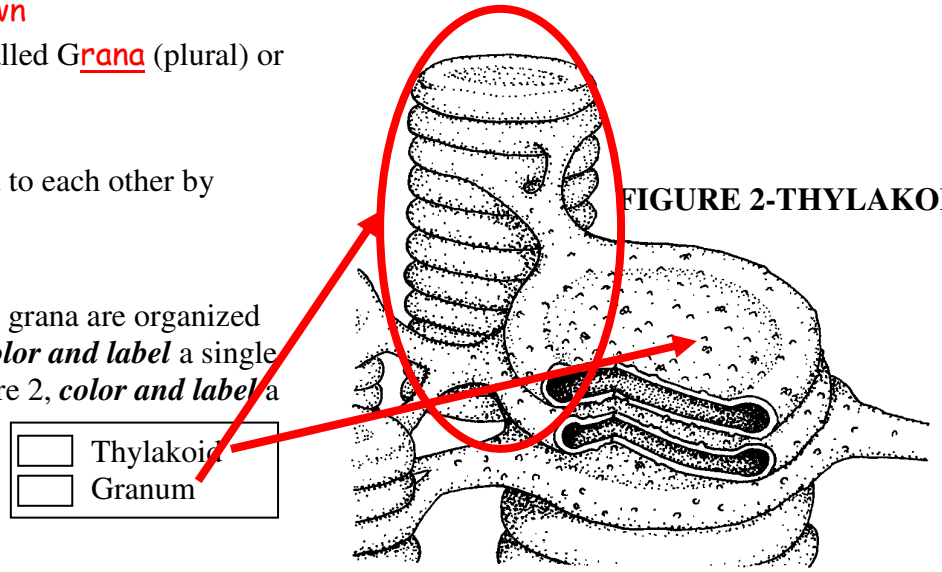
5. Other pigments that trap sunlight are called Accessory pigments. What colors are these pigments?
   Red, orange, yellow, brown

6. STACKS of thylakoids are called Grana (plural) or GRANUM (singular).

7. Stacks or grana are connected to each other by lamellae.

Light-capturing pigments in the grana are organized into **photosystems**. On Figure 2, ***color and label*** a single thylakoid (SINGLE DISK). In figure 2, ***color and label*** a granum (STACK).

FIGURE 2-THYLAKOID



Mitochondria are the powerhouses of the cell because they "burn" or break the chemical bonds of glucose to release energy to do work in a cell. Remember that this energy originally came from the sun and was stored in chemical bonds by plants during photosynthesis. **Glucose** and other **carbohydrates** made by plants during photosynthesis are broken down by the process of **aerobic cellular respiration** (requires oxygen) in the mitochondria of the cell. This releases **energy (ATP)** for the cell. The **more active a cell** (such as a muscle cell), the more mitochondria it will have. The mitochondria are about the size of a bacterial cell and are often peanut-shaped. Mitochondria have their **own DNA** and a **double membrane** like the **nucleus and chloroplast**. The **outer membrane** is smooth, while the **inner membrane** is convoluted into folds called **cristae** in order to increase the surface area.

8. What cell process occurs in the mitochondria? Cellular respiration

9. Why do some cells have MORE mitochondria? Give an example. Some cells have larger energy requirements (such as muscle cells)

10. What simple sugar is broken down in the mitochondria? glucose

11. Where does the energy in glucose come from ORIGINALLY? The sun

12. Where is this energy stored in glucose? Chemical bonds

13. Why is cellular respiration an aerobic process? It requires oxygen

14. What energy is released when the chemical bonds of glucose are broken? ATP

15. The outer membrane of the mitochondria is Smooth.

16. Why is the inner mitochondrial membrane folded? Increase surface area to maximize ATP production

17. What are the folds called? Cristae

Notice the smooth **outer membrane** and the folded **inner membrane** on figure 3. The folding greatly increases the surface area of the membrane so that carbohydrates (simple sugars) can combine with oxygen to produce ATP, **adenosine triphosphate** (the energy molecule of the cell). The **electron transport chain** takes place across the membranes of the **cristae** (**crista**, singular). Inside the cristae is a space called the **matrix** that contains enzymes needed for cellular respiration**.** ***Color and label*** the parts of the mitochondria on figure 3.

FIGURE 3 - MITOCHONDRION