

# A VISUAL GUIDE TO ANNOTATING

Annotations are a fantastic way to actively take notes and make the most of your course reading! Through annotating, you will find information in the text faster, confidently express main ideas, and study for tests, or write papers more effectively. A well-annotated text should clearly identify the main ideas and important information, trace the development of topics and arguments, and introduce your own thoughts or questions to the material.

Be sure to read through or skim your text at least once before making major annotations; simply circle unfamiliar words or concepts as you go through your first read. Utilize different colors to help emphasize main ideas, terms, or questions.

## THE RUNDOWN

**Annotating is essentially talking to the text** - Try to combine formal approaches with informal methods of annotation such as commenting, noting reactions, forming ideas, and asking questions within the margins of your text. Make the most of your space and go beyond just understanding basic concepts by talking to what you are reading!

## TYPES OF ANNOTATION STYLES

1. **Highlighting, underlining, and circling** are the least active forms of annotation, but the most common. They are mostly helpful for picking out specific points, concepts, or words, and are good ways to make reviewing large amounts of material easier.  
**TIP:** Be careful not to over-highlight, underline, or circle. Try to avoid marking information or words that restate points you are familiar with or serve as sentence fillers.
2. **Paraphrase or summary of main ideas** is a more active form of annotation where you can work on fully understanding the text by restating main points in your own words. Notes in the margins of your text can create a summary by the time you finish reading!  
**TIP:** Paraphrasing each section as you read also helps prepare for essay assignments.
3. **Descriptive outlining** allows you to break down the text into an outline format and focus on what each section or paragraph is really saying. With this method, you can also add in your own examples, definitions, or further explanations within the outline.

**TIP:** Descriptive outlining can be especially helpful in courses such as science, philosophy, and literature, where the text is heavier and covers complex ideas.

PRACTICE NOW

# EXAMPLE 1: HIGHLIGHTING, UNDERLINING, CIRCLING

## 10.5 | Types of Muscle Fibers

By the end of this section, you will be able to:

- Describe the types of skeletal muscle fibers
- Explain fast and slow muscle fibers

Important terms are boxed, and main points are highlighted. This type of text might benefit from a **Descriptive Outline** because it's so dense.

definitions

Two criteria to consider when classifying the types of muscle fibers are how fast some fibers contract relative to others, and how fibers produce ATP. Using these criteria, there are three main types of skeletal muscle fibers. **Slow oxidative (SO)** fibers contract relatively slowly and use aerobic respiration (oxygen and glucose) to produce ATP. **Fast oxidative (FO)** fibers have fast contractions and primarily use aerobic respiration, but because they may switch to anaerobic respiration (glycolysis), can fatigue more quickly than SO fibers. Lastly, **fast glycolytic (FG)** fibers have fast contractions and primarily use anaerobic glycolysis. The FG fibers fatigue more quickly than the others. Most skeletal muscles in a human contain(s) all three types, although in varying proportions.

#1

The speed of contraction is dependent on how quickly myosin's ATPase hydrolyzes ATP to produce cross-bridge action. Fast fibers hydrolyze ATP approximately twice as quickly as slow fibers, resulting in much quicker cross-bridge cycling (which pulls the thin filaments toward the center of the sarcomeres at a faster rate). The primary metabolic pathway used by a muscle fiber determines whether the fiber is classified as oxidative or glycolytic. If a fiber primarily produces ATP through aerobic pathways it is oxidative. More ATP can be produced during each metabolic cycle, making the fiber more resistant to fatigue. Glycolytic fibers, which produce less ATP per cycle.

contraction speed

Paragraphs are numbered and there is a brief summary which states the topic next to each for finding information faster.

#2

As a result, glycolytic fibers, because aerobic metabolism, which uses oxygen (O<sub>2</sub>) to produce ATP, SO fibers possess a large number of mitochondria and are capable of producing a large amount of ATP they can produce, but they have a relatively small diameter and do not produce a large amount of tension. SO fibers are extensively supplied with blood capillaries to supply O<sub>2</sub> from the red blood cells in the bloodstream. The SO fibers also possess myoglobin, an O<sub>2</sub>-carrying molecule similar to O<sub>2</sub>-carrying hemoglobin in the red blood cells. The myoglobin stores some of the needed O<sub>2</sub> within the fibers themselves (and gives SO fibers their red color). All of these features allow SO fibers to produce large quantities of ATP, which can sustain muscle activity without fatiguing for long periods of time.

oxidative fibers

SO

#3

The fact that SO fibers can function for long periods without fatiguing makes them useful in maintaining posture, producing isometric contractions, stabilizing bones and joints, and making small movements that happen often but do not require large amounts of energy. They do not produce high tension, and thus they are not used for powerful, fast movements that require high amounts of energy and rapid cross-bridge cycling.

#4

FO fibers are sometimes called intermediate fibers because they possess characteristics that are intermediate between fast fibers and slow fibers. They produce ATP relatively quickly, more quickly than SO fibers, and thus can produce relatively high amounts of tension. They are oxidative because they produce ATP aerobically, possess high amounts of mitochondria, and do not fatigue quickly. They are similar to SO fibers. FO fibers are similar to SO fibers but less energy than an explosive fiber. They produce more tension than SO fibers.

Notice how filler words are not highlighted in some sentences like the ones underlined in red above. The highlighted words form a new, concise sentence that is easier for quick reviews of the material.

#5

FG fibers primarily use anaerobic glycolysis as their ATP source. They have a large diameter and possess high amounts of glycogen, which is used in glycolysis to generate ATP quickly to produce high levels of tension. Because they do not primarily use aerobic metabolism, they do not possess substantial numbers of mitochondria or significant amounts of myoglobin and therefore have a white color. FG fibers are used to produce rapid, forceful contractions to make quick, powerful movements. These fibers fatigue quickly, permitting them to only be used for short periods. Most muscles possess a mixture of each fiber type. The predominant fiber type in a muscle is determined by the primary function of the muscle.

glycolytic fibers FG

EXAMPLE 2/3: DESCRIPTIVE OUTLINING & PARAPHRASE OR SUMMARY OF MAIN IDEAS

**Understanding How the Graphs of Parabolas are Related to Functions**

The general form of a quadratic function presents the function in the form  $y = ax^2 + bx + c$ . If  $a > 0$ , the parabola opens upward. If  $a < 0$ , the parabola opens downward. The axis of symmetry is the vertical line  $x = -\frac{b}{2a}$ . The vertex of the parabola is the point  $(-\frac{b}{2a}, \frac{4ac - b^2}{4a})$ . The x-intercepts are the solutions to the equation  $ax^2 + bx + c = 0$ . The quadratic formula,  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ , is used to solve for the x-intercepts. The discriminant,  $b^2 - 4ac$ , determines the nature of the roots. If  $b^2 - 4ac > 0$ , there are two real roots. If  $b^2 - 4ac = 0$ , there is one real root. If  $b^2 - 4ac < 0$ , there are no real roots.

Figure 4 represents the graph of the quadratic function  $y = x^2 + 4x + 3$ . Because  $a > 0$ , the parabola opens upward. The vertex is at  $(-2, -1)$ . The x-intercepts are at  $(-3, 0)$  and  $(-1, 0)$ .

**Annotations:**

- Personal notes are a good annotation tool to help you talk to the text!
- Remember for unit test #3!
- Can quadratic functions have a max or min?
- Add in questions throughout the text wherever you have them. These can be especially useful if you are reading before class or plan on visiting office hours. Asking questions directly on the text is also a good way to practice critical reading and thinking.
- The main points of the text are summarized in the margin below. Using digital note-taking methods, you may be able to create a different colored section in the margins for any important notes, paraphrases, or summaries.
- A red pen was used to make a note about where to be careful in formulas. This annotation tactic of using different colors can be used in various ways but may be especially helpful in STEM classes!
- formulas:
  - axis of symmetry:  $x = -b/2a$   
↳ vert. line intersecting parabola @ vertex
  - quadratic formula:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$   
↳ use to solve for x-int. in  $ax^2 + bx + c$
  - parabola opens down if  $a < 0$

**10.5 Types of Muscle Fibers**

**P1. DEFINITIONS/INTRO OF SO, FO, & FG FIBERS**

- a. SO fibers (slow oxidative), FO (fast oxidative), FG (fast glycolytic)

Be sure to title your outline so it is easier to locate the correct one later.

**P2. CONTRACTION SPEED**

- a. Contraction speed = dependent on speed of ATP for cross-bridge action
  - i. Fast fibers hydrolyze ATP faster than slow fibers
- b. Primary metabolic path used by fiber
  - i. Aerobic ATP production = oxidative phosphorylation
  - ii. Anaerobic ATP production = glycolysis

Notice how each paragraph is labeled by its corresponding number and topic from Example 1.

**P3. OXIDATIVE FIBERS – SO (aerobic)**

- a. Contains: many mitochondria, many myoglobin, many blood capillaries
  - i. Many mitochondria allows for (1) long contraction periods, (2) high ATP production
- b. Color: red bc of heavy blood supply & high myoglobin presence
  - i. Shape is smaller in diameter
- c. Purpose: functions for longer periods without exhaustion; not used for quick movements (i.e. sprinting)

Keep your outline short, only add the most important points from the text. Know that it's okay to not write in full sentences.

**P4. OXIDATIVE FIBERS – FO (aerobic) (note: may also be called intermediate fibers)**

- a. Contains: many mitochondria, less myoglobin than SO
  - i. Produce ATP faster than SO, means more tension but still no quick fatigue
- b. Color: lighter red/pink-ish bc of less myoglobin presence
- c. Purpose: used primarily for movements (i.e. walking)

Examples were added to the outline to aid studying and the student's overall understanding.

**P5. GLYCOLIC FIBERS – FG (anaerobic)**

- a. Contains: many glycogen, no significant amt. of mitochondria or myoglobin
- b. Color: white bc no significant mitochondria or myoglobin presence
  - i. Shape is larger in diameter
- c. Purpose: good for rapid, forceful contractions that make fast/powerful movements (i.e. sprinting & jumping)

Extra information to help with having a deeper understanding of the text was also added.