Colors and Gems

# 2 The Gemstone Studies Course

# Colors and Gems

## In This Lesson:



## THE MAGIC INGREDIENT

The fiery red glow of a ruby or the lush cool green of emerald, a sapphire's blue serenity or the rainbow at play in an opal – for each of these gems (and most others, too) color is the magic ingredient. It catches the eye, sparks the imagination, and lures the heart.

*Color involves not only the physical sensation of beauty, but also mental and emotional response.*

Tuning in to color's strong appeal can add enjoyment and meaning to gemstones you own, purchase, or see. The appeal of color has many levels involving concepts and emotions as well as the visual perception of beauty. Some of these levels or associations are linked to nature while others arise from culture. Then there are those that reflect personal events and meanings.

Try to think about and identify the aspects of color that "speak" to you when you view and interact with colored gems – whether you're in a buying situation or some other setting. Does the golden yellow color of a topaz make you think of autumn leaves, maybe a favorite season? Are you drawn to yellow's place in trendy fashion palettes, or are you perhaps interested in the fact that yellow traditionally denotes happiness?

Color is the top value factor for most gems, and you should be able to understand its role in pricing. Color can also give you glimpses into the mysteries of how gems are created, or help you understand the scientific detective work through which gems are identified.

*Cover photo courtesy R.A. Bentley.*

In the lessons ahead you'll examine all these topics. Here, however, at the beginning of your adventure into the gem world, let's take a look at the "big picture" of color – how we see it and how it affects us, the realms of color from nature's canvas to personal preferences, and some of the endless varieties offered in the gem world.

Color is
all around us
all the time.

## Lesson Objectives

**When you have successfully completed this lesson, you will be able to:**

- Identify factors that affect color perception.
- Discuss the emotions and symbolism of color.
- Identify links between gem and fashion colors.
- Use your understanding and awareness of color when shopping for gemstones.

*The fascinating internal world of gems comes alive when you try to identify them.*

## THE COLOR EQUATION

Many people take color for granted because it's all around us all the time. In reality, however, color is a fascinating and amazingly complex phenomenon. It's produced by the interplay between energy, matter, the senses, and the mind.

You don't need to know all the technical details, but grasping the basic equation will help you appreciate the magic of color. This basic equation is reasonably simple. In most cases, there are just three key "players" – ***light***, an ***object***, and the ***viewer***.

## Light

Except for dreams, visions, and other mental events (like flashes after a bump on the head), the colors you see largely depend on the light that's available at a particular time and place. Take, for example, a red rose. In moonlight it might appear dark brown; a little before dawn, deep maroon; and at mid-morning, bright crimson. The rose doesn't change, but the light does.

*Color is an amazingly complex phenomenon produced by an ever changing interplay between light, objects and you.*

A major factor in the change – and its dramatic effect on the flower – is the light's color content. Most "white" light is a mixture of all spectral colors. These are revealed if the light shines through a prism. When this happens you can see the well-known rainbow spectrum of red, orange, yellow, green, blue, indigo, violet, and all the color blends in between.

*The color of lighting can make the same subject look completely different.*

The color content of white light can vary. We usually don't notice the variations because our eyes automatically adjust to them, but they still exist. Full sunlight contains a fairly balanced color blend, but daylight's color shifts considerably depending on the time and weather conditions. Most fluorescent lights, though they appear "white," are weighted toward blue and green. Incandescent lights – like the bulbs in most homes and the spotlights in many jewelry stores – also appear "white," but actually put out more yellow, orange, and red. Some stores now use halogen bulbs, which generally strive to balance the components of color.

Even minor differences in light's color content can have a significant impact on how you perceive a color. Though you may not have analyzed the way the color of a rose changes through the day, you might have bought a blouse or shirt that looked great in the clothing store, but turned drab at home. Or maybe it matched an outfit perfectly when you tried it on, but not when you wore it. In either case, a difference in lighting was probably the culprit.

The same thing can happen with gems. The right light will bring a gem's color to life – but the opposite is true as well. A neon-blue tourmaline that's positively luminous under the cool-white fluorescents of an office may look dull and sleepy during a candlelight dinner. In the same settings, a mandarin-orange garnet might snooze through the workday, but add passionate glints to the evening's romance.

Since light is the starting point for color, colored gems can look different in some surroundings than in others, depending on the light to which they're exposed. You may also notice a difference when you wear gemstone jewelry in daylight or artificial illumination. It's all part of the mystery and wonder of color.

## Object

While light is the additive part of the color equation, the next component usually involves subtraction. The process is called selective ***absorption***, and the concept is simple: In most cases, the atoms that compose an object cause it to soak up (or absorb) certain elements (or colors) of white light. The colors that are not absorbed are reflected by the object — and we see them as the object's color. The rose in the garden absorbs most colors except red. An amethyst absorbs orange, yellow, and green, leaving a mix of red and blue which we see as purple.

*Amethyst selectively absorbs most colors except red and blue, which combine to display the colors you see.*

*Photo courtesy Tino Hammid.*

Gems play with light in many ways. When you look closely at an amethyst, you most often don't see a single uniform color. Instead, there's a kaleidoscopic dance as you rock the gem back and forth. That's because light rays are absorbed a little differently as they enter the amethyst, bounce around inside, and then reflect back to your eyes. Good cutting maximizes this optical choreography.

In some gems, light takes on different colors as it travels in different directions. This is known as ***pleochroism*** (PLEE-oh-crow-ism), and one gem that shows it particularly well is tanzanite. Depending on the direction through which you look at a tanzanite crystal, you see various blends of blue, purple, and pale greenish yellow. When the crystal is cut, it must be oriented so the most attractive combination – the blue and purple – will be seen when the finished gem is set in jewelry.

*Depending on the direction you look at tanzanite, you see various blends of blue and purple.*

*Photo courtesy Gem Tech.*

Good cutting maximizes the optical choreography.

Other gems display different colors side-by-side. This results from variations in the type or concentration of coloring agents that are present. A watermelon tourmaline may be half green and half pink. Ametrine shows amethyst's purple next to the orange or yellow of citrine. In the kind of jade called moss-in-snow, delicate green veins run through a background of pure white.

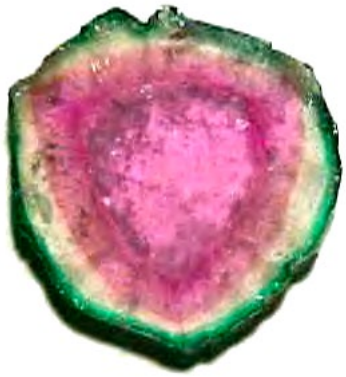
There are also gems that display completely different colors in different types of light. A great example is the alexandrite variety of chrysoberyl. It's red in incandescent light, but green in daylight or under a standard fluorescent lamp. The light's color content and the way the gem responds to it combine to create this effect. As a result, alexandrite is classified as one of the "phenomenal" gems. You'll learn more about this special group in the next lesson.

*Alexandrite displays different colors when viewed in different kinds of light.*

*Photos courtesy Tino Hammid.*

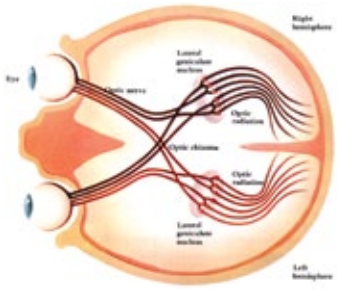
*Incandescent Light*

*Daylight*



*Watermelon tourmaline is aptly named for it's resemblance to a watermelon fruit slice.*

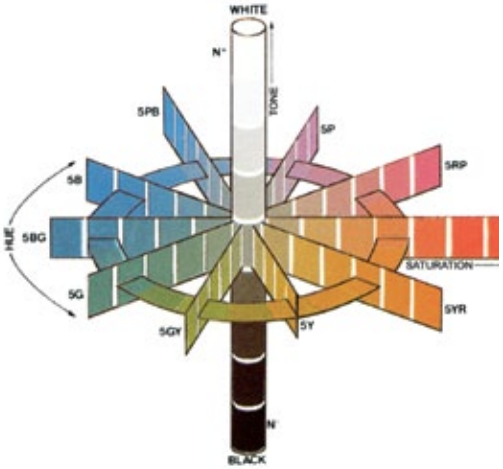
## You



*Your eyes and brain are the most complicated components of how you see color.*

After light adds color and the object subtracts it, you – or your eyes and brain, to be exact – total up the equation. This is the most complicated step in the process, but the outline is still pretty straightforward: Light reflected from the object enters your eyes and hits specialized cells that convert it to electro-chemical signals. These go to your brain, which decodes them and creates the final color image.

From your own experience, you know the results can be delightful. From a scientific standpoint they're also amazing. Researchers say most people can distinguish more than 7 million different colors. With training and proper conditions, the number jumps to about 10 million. That includes the colors of the spectrum, plus black and white, and all the shades and tints from grays, browns, and pale pastels to the most vibrant visual fireworks.




*The three dimensions of color – hue, tone and saturation.*

*Courtesy Munsell.*

Most of these color perceptions have three dimensions:

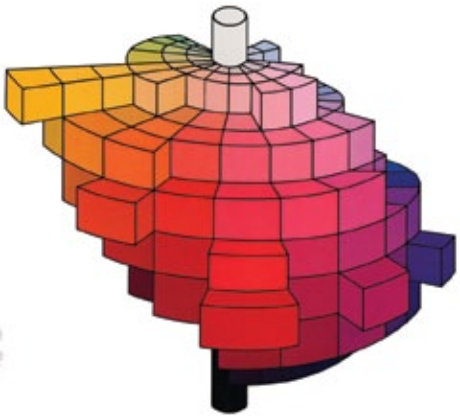
- **Hue** – This usually gives a color its generic name: red, yellow, blue, red-orange, blue-green, yellowish orange, greenish blue, and so forth.
- **Tone** – The color's lightness or darkness. Totally neutral tones (without any hue) are pure black, pure white, and the variations of gray in between. Examples of tone differences with hues include pink and red, and sky and navy blue.
- **Saturation** – The color's strength and purity. This is also called brightness, chroma, or intensity. All these terms describe variations running from dull (grayish or brownish) to vivid. Sage green and slate blue are near the dull end of that scale. Emerald green and royal blue are at the vivid end.

When they're combined, hue, tone, and saturation define a color much like latitude, longitude, and elevation pinpoint a geographic location. Being aware of color dimensions can help you understand relationships that are important in art, décor, fashion, and other areas – including jewelry design, fashion, and wardrobing

*Tone is the variation of a hue from light to dark.*

*Courtesy Munsell.*

Saturation is the color's strength and purity.



*Hue, tone and saturation form a "World of Color".*

*Courtesy Munsell.*

## RESPONSES TO COLOR

The ability to perceive color isn't unique to our species. Many animals have limited color vision. Some birds and reptiles, as well as most primates, possess the optical "equipment" to see color as effectively as we do. One thing that sets us apart, however, is the range of our responses to color. Animals use their color vision mainly to identify food, threats, and mates. Over generations, humans have built on their instincts through creative thinking, communication, and shared traditions. As a result, colors have multiple effects and meanings for human beings today.

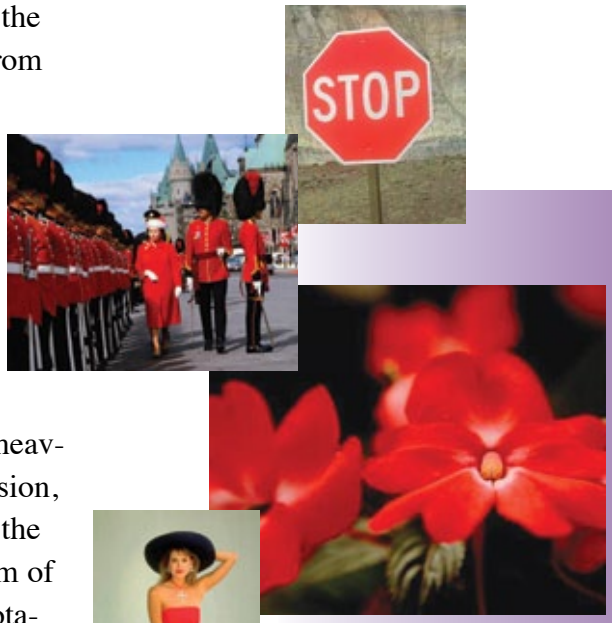
*Red speeds the pulse and sends adrenaline pumping.*

*Photo courtesy High Graphic*

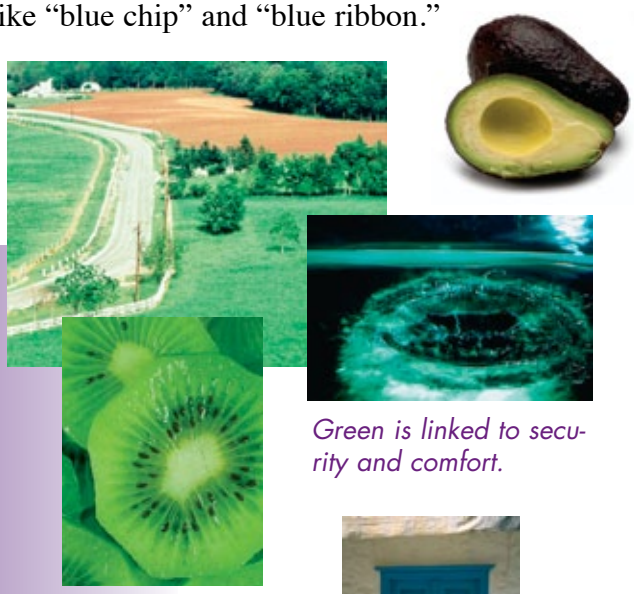
Colors have multiple effects and meanings on a human being.

- **Mind and Body** – Experiments have shown that colors affect physical functions such as heartbeat and brain activity. They also influence perceptions of size, weight, and temperature. Dark colors tend to make objects look smaller and feel heavier. Light colors do the opposite. Reds, oranges, and yellows generate sensations of warmth. Greens, blues, and violets seem cool. Fire-engine red speeds the pulse and sends adrenaline pumping through the body. Midnight blue lowers blood pressure and quiets the nervous system. As you might imagine, colors between the extremes are intermediate in the reactions they cause.
- **Emotions** – Some medical experts believe different colors stimulate brain areas that control certain glands, along with hormones and the moods they produce. A number of psychologists are similarly convinced that color likes and dislikes yield insights into personality. Neither theory has been proven fully, but most people would agree that color both influences and expresses emotions. The consensus is that red packs the most powerful punch by evoking or reflecting passion – whether it's in the form of love or hate, ecstasy or rage. At their best, orange and yellow are happy, uplifting, and invigorating. Green is linked to security and comfort. Blue conveys inner peace. Violet communicates emotional complexity, and purple signifies sensual enjoyment.

- **Symbolism** – In the early light of human imagination, the colors of the yearly seasons stood for the stages of life, from birth through death. Soon after, perhaps, colors came to symbolize the elements of creation and personal being – earth, air, fire, and water; body, spirit, heart, and mind. Over time, natural connections grew into abstract concepts, and history added new meanings. Blue provides a good example of such evolution. Being the color of sky and ocean made it an intuitive choice to represent the highest and deepest of forces. Thus, since ancient times, blue has been associated with heavenly power, earthly authority, and eternal spirit. By extension, peace, mercy, and truth became part of its symbolism. In the 1300s an English king picked a blue garter for the emblem of the noblest order of knighthood. This bestowed the connotation of superior quality and achievement now carried by terms like "blue chip" and "blue ribbon."




*Red evokes passion and high emotion.*



*Green is linked to security and comfort.*

*Blue conveys inner peace.*

Because they're essentially hardwired into our brains and nervous systems, the effects of color on mind and body are almost universal. Symbolism, however, is often rooted in culture. For instance, white (for purity) is a traditional wedding color in the US, but green (for fertility) once had that status in Europe, and red (for joy) was favored in China.

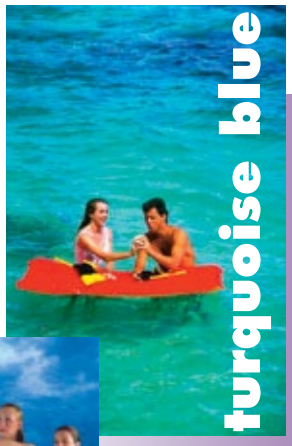
Colors can have negative symbolism, too. Yellow can mean cowardice, green can denote decay, blue can be melancholy, and there are similar downsides for almost every color.

*The symbolism of color is often rooted in culture.*

Emotional responses are highly subjective, and they are therefore difficult to predict with certainty. Life experiences often determine whether a particular color makes someone feel happy, sad, or indifferent. The specifics of hue, tone, and saturation matter as well. (Just consider the emotional difference between indigo and turquoise blue. To most people, indigo is a solid and anchoring color – subdued yet strong. Turquoise is lighter, freer, somewhat flighty and happy.) Fads and fashions also have influence on the emotions people attach to colors.

Life experiences often determine whether a particular color makes someone feel happy, sad, or indifferent.

In Lesson 10 you'll find an expanded list of color-related images, feelings, and ideas. Right now, it's important to realize that seemingly simple preferences can have hidden depths that affect your preferences and choices. For example, if you love aquamarines because that particular shade of blue is your favorite color, you might be responding instinctively to the gem's sea-blue charms. Perhaps the color invokes the mystic power of water, or maybe it brings to mind a dress you loved when you were a little girl. Thinking about why you love a color can give you a deeper feeling for possibilities, and enable you to truly enjoy all a color represents.




*Turquoise: lighter and freer; happy.*


*Indigo: solid and anchoring; serious.*

## LIFE'S COLOR CYCLES

Consciously or not, all of us live within cycles of color. From spring and summer, to fall and winter, nature sets the tempo and sounds the keynotes with a rhythm of chromatic progressions. In some places, the effect is like a soft background tune. In others, it's a full-blown symphony. Anywhere you happen to be, though, the changing colors of earth and sky mark the passing of time on a planetary scale.

*Spring, Summer, Fall and Winter – nature displays a rhythm of chromatic progressions.*

Colorful arrangements and knickknacks make a home interesting.

Human communities also have their color cycles. Across the country, lights and decorations go up for the year-end holiday season. Fireworks illuminate New Year's Eve and the Fourth of July. Grinning jack-o'-lanterns greet costumed kids on Halloween. Whenever people celebrate their heritage, identity, or civic pride, the streets erupt in color. And as each faith observes its calendar of worship, specific colors almost always have a role in the ceremonies.

There are less public cycles as well, and – like some of the grander ones – they help to keep life interesting. Maybe you add festive touches to your home for holidays, birthdays, and anniversaries. You might periodically spruce things up with fresh flower arrangements, or experiment with the colors of knickknacks, throw pillows, and so forth. Color plays an important part in communicating your self image, establishing an emotional tone in your home, and making your environment look inviting.

## Color and Fashion

For some people, the color cycles of greatest interest exist in the world of fashion. Twice a year, at the fashion centers of the world, the latest palettes come strutting down designer runways. Not long afterward, they're in catalogs and on ready-to-wear racks across the country. Between premier and mass-market appearances, they splash through websites, magazines, television programs, and the lifestyle sections of newspapers.

Fashion colors and "personal palettes" were once tied to the four seasons of nature – fall, winter, spring, and summer. Modern tastes, fabrics, and dyeing methods have liberated them from those old boundaries. However, they still have definite cycles.

A complete turn of the fashion wheel typically includes basic black and classic white, nearly neutral grays and beiges, earth tones, pastels, stronger tints, and bold pure hues. It might take a decade, and the sequence can vary – frequently subject to pop influences from Hollywood, Broadway, and YouTube – but sooner or later, every "in" color goes out and comes back again.

*Twice a year the latest fashion palettes come strutting down the designers runways.*

*Photo courtesy James de Givenchy.*

It might take a decade…
but sooner or later,
every color comes back.

*For centuries, jewelry has been a primary fashion accessory.*

*Photo courtesy Scavia.*

For centuries jewelry has been a fashion accessory, and that role has become even more prominent in recent years. It's not surprising, then, that gems also experience vogues. This season's hits might be the luscious pinks and reddish purples of rubellite tourmaline and "raspberry" rhodolite garnet. Next season may call for the warm friendly oranges or yellows of citrine and "sherry" topaz. After that, the tart citrusy greens of peridot and tsavorite could be in style.

Fine jewelry can be costly, however, and an essential element of gem appeal is permanence. So, while you keep your finger on fashion's pulse, you'll also want to keep an eye on the timeless beauty and long-term value of gems you choose.

To balance these contradictory concerns, you might approach purchasing jewelry like buying clothes – with an effort to create a well-rounded wardrobe. It makes sense to invest in items that are functional, versatile, and meaningful – in other words, pieces you feel you'll be able to enjoy often and for years to come. Then, as opportunity and budget allow, you can make additions for variety or special occasions.

*It makes sense to invest in items that are functional, versatile and meaningful.*

*Photo courtesy Barbara Westwood.*

## SHOPPING FOR COLOR

No matter how you look at color, your thoughts, feelings, and priorities may be mirrored in the gems you select. Gems occur in every color, so it's always possible to match a preference. Regardless of fashion's current direction, there will always be a gem to provide the perfect accent. There's no better way to express feelings, communicate personal messages, or simply celebrate being yourself.

*Regardless of fashion direction, some gems are bound to be the perfect accent.*

Since color is usually the first gemstone feature that catches your attention, it's also the logical place to begin when considering a purchase. The depth and quality of color gives gems their value. Expert cutting, too, is required to display colors at their best. You might select a color, such as emerald, for its tradition, but you might also prefer a neon-colored Paraiba tourmaline for the very fact that it is relatively new on the market. Because it is not unusual for gemstone colors to have been affected by treatment, you'll want to be sure to ask about this and understand any special care requirements there might be.

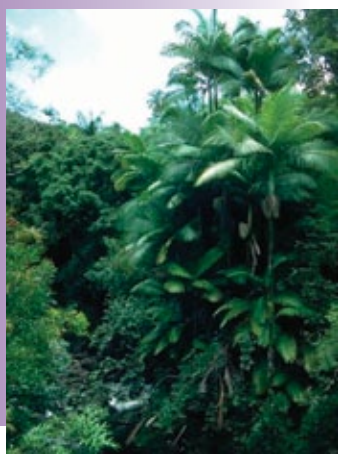
Whether it comes to beauty, value, interest, or treatment, the gemstone's color is always the place to start. When you start shopping for colored stones, there are three things you should begin to do:

- **Pay attention to color** – Whatever your present level of color consciousness, try to take it higher. For general information or inspiration there are lots of sources

available on the Internet. Popular websites and magazines cover color from a fashion angle. To gain "street-level" insights, pay attention to the color schemes in blockbuster movies and hit TV shows. Look at how color is used in trend-setting clubs, restaurants, and stores. Study the colors in department store fashion windows. In fact, become a keen observer of color everywhere you go. Most of all, think about the role color plays in your life. Then you'll be able to bring your heightened awareness and enjoyment of color to your gemstone selections.

*Tanzanite was discovered only 50 years ago but its color has made it one of the world's favorite gems.*

*Photo courtesy Jean François Albert.*



*Observing the colors in nature gives you a keener sensitivity to them.*

- **Learn more about gems** – Connecting color with gems takes a combination of general understanding and self awareness. Upcoming lessons explain how color relates to product distinctions, value factors, identification methods, and gem romance. *The Colored Gemstone Compendium* provides additional information for most of the gems you're likely to see in a jewelry store or other venues. Together, the lessons and compendium present overviews and close-ups that enrich your interest in color and gemstones. They also form a solid foundation on which you can continue to build.
- **Be aware of your preferences** – Though it might sound cliché to say that every person is unique, it's true. Individual differences can start at the level of basic visual perception. (People who suffer from color confusion – once called color blindness – are good examples.) Complexion and hair color often dictate choices for personal wardrobes, and thus the gems that might serve as accessories. Personality also plays a dramatic yet unpredictable role.

Once you are aware of your own needs, desires, and motivations, you'll be able to tell a sales associate or gem dealer exactly what you're looking for, ask the right questions, and go home with gemstone jewelry that will give you decades of pleasure.

## RECAP OF KEY POINTS

- For most gems, color is a primary feature of appeal and value. This makes tuning in to color an essential for anyone who's interested in gemstones.
- Color is normally produced by the interplay between light, an object, and the eyes and brain. Each component of this equation has a critical effect on how we perceive color, and on the way colors appear in different types of gems.
- Human responses to color can involve mind and body, emotions, and symbolism. The effects of color on mind and body are almost universal. Symbolism is often rooted in culture, and emotional responses are highly subjective. As a result, personal color preferences can have considerable depth.
- Color cycles exist in nature, in human communities, and at more personal levels. For some people, the cycles of greatest interest lie in the world of fashion. Jewelry has always been a fashion accessory, but fine jewelry can also be costly, and permanence is part of gem appeal. To help balance these concerns, think of buying gems as you would about building a clothing wardrobe.
- No matter how you look at color, you'll see your thoughts, feelings, and priorities reflected in the gems you choose. Color is usually the logical place to when shopping for gemstones, and it can be a unifying theme as well. To make a confident purchase, you need to learn more about gems and your own preferences about color.

# Lesson 2 Self-Test

This lesson also includes a Self-Test that's designed to help you gauge your comprehension of the lesson material. The test is an important part of the learning process, so be sure to complete it.

When you're ready to take the test, go to the Course Materials page (the one that lists all the lessons) and click on "Self-Test." Make certain you select the test for this lesson.

All questions in the test are based on Lesson 2. More than one answer for a question might seem correct, but you should select the one **best** answer based on the lesson discussion.

As you take the test, you may refer to the lesson. To do this, you'll need to have the lesson loaded in a separate window of your browser.

If you feel certain about a question, try answering it without looking at the lesson. But if you're not sure, check the lesson before answering.

After you answer a question, you'll receive immediate results and feedback. You'll find out whether you answered correctly, what the correct answer was (in case you missed it), and also the page number in the lesson where the information can be found. Take time to review any material you're not completely clear on.

At the end of the test, you'll receive your overall results. Then you'll be able to continue to the next step in your coursework.

If you have questions or need help, please contact us. You can use this website – just click on "Help." You can also email studenthelp@diamondcouncil.org or phone 615-385-5301 / toll free 877-283-5669.

***After you take the Self-Test for this lesson, you'll be ready to complete Learning Evaluation 1 and Satisfaction Evaluation 1.***