SCIENCE of art

MUSEUM OF GLASS

Curriculum
Color in Glass

SCIENCE of art
Curriculum
Color in Glass
MUSEUM OF GLASS

Dear Educator,

Thank you for booking a Science of Art teaching artist visit and tour with the Museum of Glass. We look forward to working with you and your class!

This learning process is designed to inspire you and your students to think deeply about connections between art and science in your classroom, in the museum, and beyond.

A pre-tour classroom presentation by a museum art educator will pose questions and introduce concepts that will help prepare your students for their Science of Art museum experience. This packet also provides corresponding art and science information as a supporting resource.

Post-tour assessment strategies are provided to check for and validate student understanding of art and science concepts, processes and interrelationships explored through this program.

Along with this packet, we have extensive information on our website about glass blowing and working with hot glass. Visit **museumofglass.org/education**. There are several lessons and interactivities about many glass-related topics. In the Virtual Hot Shop your students will get a taste for glass blowing while online. Participants walk through the process step-by-step until they get a finished work of art! Along the way they can also choose to read more and view video clips of the process live.

Table of Contents

EALRs & GLEs 3

Before Your Museum Visit: Teaching Artist Visit 4

Introduction 5

Information and Learning Activities 6

During Your Museum Visit 13

Museum Visit Activities 14

After Your Museum Visit 15

Classroom Assessment 16

Resources 17

EALRs & GLEs

Science

1.1 Understand how properties are used to identify, describe, and categorize substances, materials, and objects and how characteristics are used to categorize living things.

1.2 Know and apply scientific concepts and principles to understand the properties, structures, and changes in physical systems.

1.3 Understand how interactions within and among systems cause changes in matter and energy.

3.1 Apply knowledge and skills of science and technology to design solutions to human problems or meet challenges.

3.2 Analyze how science and technology are human endeavors, interrelated to each other, society, the workplace, and the environment.

The Arts

1.3 Apply audience skills in a variety of arts settings and performances.

2.1 Apply a creative process.

2.3 Apply a responding process to an arts presentation: engage actively and purposefully, describe what is seen and/or heard, analyze how the elements are arranged and organized, interpret based on descriptive properties, evaluate using supportive evidence and criteria.

3.3 Develop personal aesthetic criteria to communicate artistic choices.

4.2 Demonstrate and analyze the connection between art and other content areas.

4.4 Understand that the arts shape and reflect culture and history.

Before

Your Museum Visit

Essential Questions and concepts will be introduced by our Art Educator in your classroom.

Color in Glass

How did glass influence the science of color and light?

Starting in 1666 Isaac Newton (1642-1727, England) performed a famous series of experiments in which he shined white light through prisms (triangular shaped pieces of glass). Prisms create a ***spectrum*** (a term coined by Newton) similar to that of the rainbow. Newton's experiments showed that ***white light*** is composed of a continuous range of spectral colors (hues), which he designated red, orange, yellow, green, blue, indigo, and violet.

How does light interact with glass to make color?

The color of an opaque object depends upon the color of light reflected and the color of a transparent object depends upon the color of light transmitted. Clear glass, for example, transmits all the colors of white light equally well while red glass only transmits red light. ***Selective absorption*** refers to how chemical additives have energy levels that allow certain colors (wavelengths) to be absorbed more than others.

Why do artists choose glass as a material for art-making?

Artists choose a ***creative process*** or art material because it has the potential to communicate specific ideas or has certain aesthetic qualities. Learning about the science of color helps us to better understand the unique ways that color and light can be manipulated by glass artists.

- Science GLE 1.1.3 Wave behaviors: Understand wave behaviors, including reflection, refraction, transmission and absorption

- Science GLE 1.1.1 Understand the atomic nature of matter, how it relates to physical and chemical properties and serves as the basis for the structure and use of the periodic table

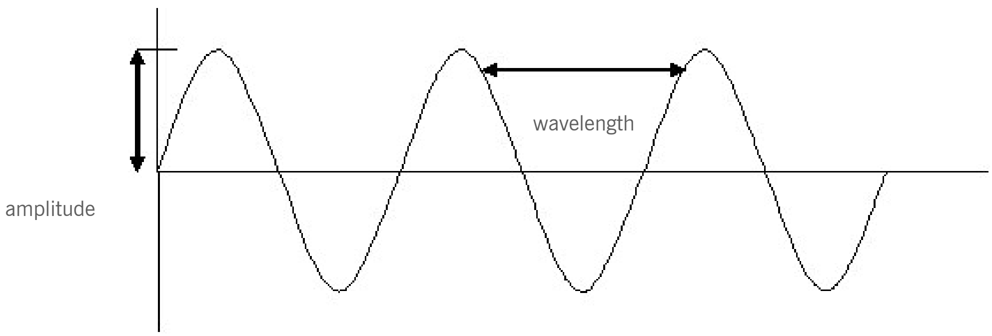
- Art EALR 2.1 Applies a creative process in the arts
  Conceptualizes the context or purpose
  Gathers information from diverse sources
  Develops ideas and techniques
  Organizes arts elements, forms and/or principles into a creative work
  Reflects for the purpose of elaboration and self evaluation
  Refines work based on feedback, Presents work to others

Color is a wavelength?

Light is an ***electromagnetic wave***. Visible light is just a small portion of the ***electromagnetic spectrum,*** which includes ultra violet, infrared, radio waves, x-rays, etc. Light waves have a frequency as well as a wavelength. The frequency of visible light is detected by the eye as color.

Our understanding of how light interacts with matter is aided by using a ***wave model*** for light. There are many types of waves in nature, including water waves, waves on a stretched string, and sound waves in the air.

light: the portion of the electromagnetic spectrum (range of waves) visible to the eye



The distance between adjacent peaks of a wave is called the ***wavelength.***
The longest wavelengths (lowest frequencies) are red and the shortest are violet. The colors of the spectrum can be seen when light is dispersed through a prism as Newton discovered or when light is diffracted such as in a CD or diffraction grating—a piece of glass or plastic with parallel slots or lines that break white light into the color spectrum.

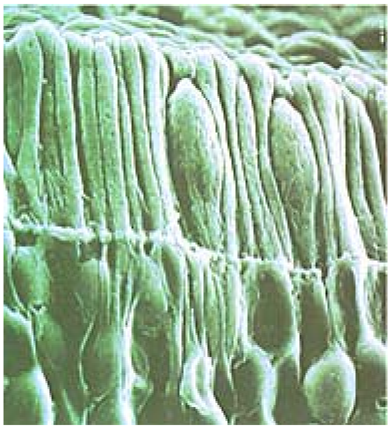
Students Engage!

How is color in glass different than color in other art materials? What ways can light interact with glass to make color?

Think about when you have seen the color spectrum: Where did you see it? Was it a natural phenomena or light interacting with an object?

How we see Color

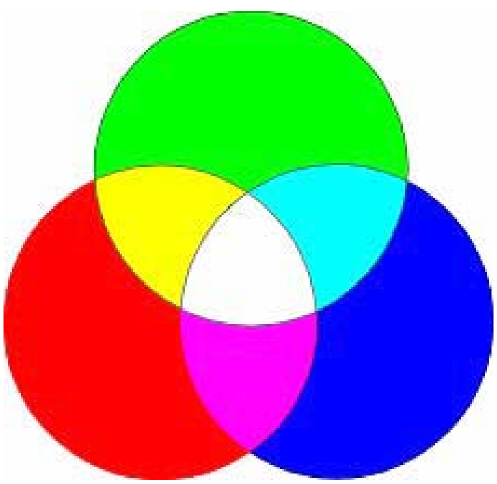
We do not perceive each frequency of the light spectrum equally. The color we see is directly related to the nerves stimulated in the ***retina*** of our eyes. In the human eye, there



are three types of colored ***light receptors*** or ***cones*** that respond to red, blue and green light respectively. Each type of cone responds to light by sending a signal to the brain proportional to the intensity of the light. The combination of signals received from the red, blue and green cones is interpreted by the brain as the other colors. The huge variety of color, hue and tint seen by the human eye is due to variations in the rate of the cone signals.

white light: light from the sun or an artificial source—it appears white but is composed of all of the colors of the visible light spectrum.

Because the three types of cones respond to ***red, blue*** and ***green light***, the ***primary colors of light*** are red, blue and green. A combination of all three colors is seen as ***white light***. Red and blue together are seen as magenta, red and green are seen as yellow, and blue and green are seen as cyan. The colors ***magenta***, ***yellow*** and ***cyan*** are called the ***secondary colors of light***. The process of adding the primary colors of light to obtain all the other colors of light is called the ***additive process***.



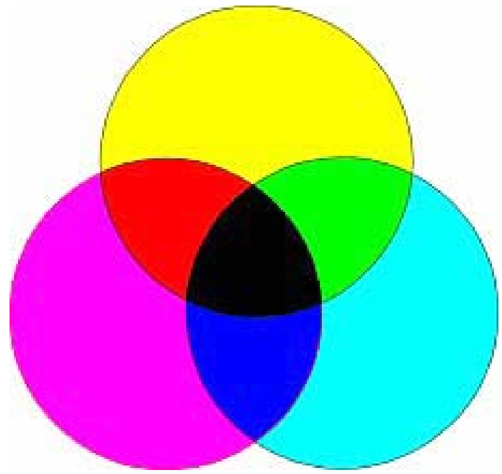
Additive colors of light

primary colors of light: red, blue and green light—all three combined make white light

secondary colors of light: combination of the primary colors of light: magenta (blue +red light), yellow (red +green, light) and cyan (green + blue light)

When the primary colors of light are added in pairs they make the secondary colors of light: magenta, yellow and cyan. In the ***subtractive process*** note how each secondary color of light has one color of white light (red, green and blue) missing or subtracted. Magenta (since it is made from red and blue light) has green subtracted; cyan has red subtracted, and yellow has blue subtracted. Where two secondary colors overlap, two primary colors are subtracted leaving one primary color. A combination of all three of the secondary colors of light overlapping results in all of the primary colors of light (red, green and blue) being subtracted --which we see as black or an absence of light.

subtractive process: selective removal of colors from white light



Subtractive colors of light

Matter and Color

The color of most objects is created by ***selective absorption.*** Some colors of light are subtracted and not seen because they are absorbed and others are seen because they are reflected or transmitted**.** Pigments ***reflect*** or transmit a specific color and absorb all the other colors from white light.

pigment: a colored material that absorbs certain colors and reflects or transmits other colors

The ***pigments***—the components that produce color in dyes, paints, food colorings etc. are used because they have ***molecules*** that absorb and reflect specific colors of light. This occurs when a material absorbs some ***wavelengths*** (hues) of light more readily than others.

selective absorption: when one color of white light is transmitted or reflected and others are absorbed

With an ***opaque*** object, the reflected light will be colored because certain hues have been selectively absorbed out of the incident white light. For example, when white light shines on a red house, only red light is reflected, and blue and green light are absorbed by the red pigment.

With a ***transparent object***, the transmitted light will be colored for the same reason. Clear glass, for example, transmits all the colors of ***white light*** equally well where as green glass only transmits only green light and absorbs red and blue light.

What causes selective absorption? All matter is composed of ***atoms*** and molecules (combinations of atoms)—their structure determines what color they transmit or reflect or absorb. The ***periodic table of the elements*** lists all the atoms found in nature.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 **H** 1.0079																	2 **He** 4.0026
3 **Li** 6.941	4 **Be** 9.0122											5 **B** 10.811	6 **C** 12.011	7 **N** 14.007	8 **O** 15.999	9 **F** 18.998	10 **Ne** 20.180
11 **Na** 22.990	12 **Mg** 24.305											13 **Al** 26.982	14 **Si** 28.086	15 **P** 30.974	16 **S** 32.065	17 **Cl** 35.453	18 **Ar** 39.948
19 **K** 39.098	20 **Ca** 40.078	21 **Sc** 44.956	22 **Ti** 47.867	23 **V** 50.942	24 **Cr** 51.996	25 **Mn** 54.938	26 **Fe** 55.845	27 **Co** 58.933	28 **Ni** 58.693	29 **Cu** 63.546	30 **Zn** 65.409	31 **Ga** 69.723	32 **Ge** 72.64	33 **As** 74.922	34 **Se** 78.96	35 **Br** 79.904	36 **Kr** 83.798
37 **Rb** 85.468	38 **Sr** 87.62	39 **Y** 88.906	40 **Zr** 91.224	41 **Nb** 92.906	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.76	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.29
55 **Cs** 132.91	56 **Ba** 137.33	57-71 *	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.84	75 **Re** 186.21	76 **Os** 190.23	77 **Ir** 192.22	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.2	83 **Bi** 208.98	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** (226)	89-103 #	104 **Rf** (261)	105 **Db** (262)	106 **Sg** (266)	107 **Bh** (264)	108 **Hs** (277)	109 **Mt** (268)	110 **Uun** (281)	111 **Uuu** (272)	112 **Uub** (285)		114 **Uuq** (289)				

* Lanthanide series	57 **La** 138.91	58 **Ce** 140.12	59 **Pr** 140.91	60 **Nd** 144.24	61 **Pm** (145)	62 **Sm** 150.36	63 **Eu** 151.96	64 **Gd** 157.25	65 **Tb** 158.93	66 **Dy** 162.50	67 **Ho** 164.93	68 **Er** 167.26	69 **Tm** 168.93	70 **Yb** 173.04	71 **Lu** 174.97
# Actinide series	89 **Ac** (227)	90 **Th** 232.04	91 **Pa** 231.04	92 **U** 238.03	93 **Np** (237)	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (262)

A wide range of chemical additives can be used in glass to selectively absorb various colors. These colorants can be added to the surface of hot clear glass in the form of solid rods, chunks, or powder. The colorants can also be included in the original powdered mix (batch) to achieve glass of a uniform color.

Glass Colorant Examples

Cobalt carbonate ($CoCO_3$)	deep dark blue ("cobalt blue")
Chromium oxide (Cr_2O_3)	emerald green
Copper oxide ($CuCO_3$)	blues, greens, and reds
Magnesium oxide (manganese)	purples, blue/violets, and browns
Silver ($AgNO_3$)	various colors from yellows to blues
Gold chloride ($AuCl_3$)	ruby red
Iron (Fe_2O_3)	greens and browns
Cadmium sulfide (CdS)	oranges
Cadmium selenium (CdSe)	deep ruby reds

Students Engage!

What are some of the colorants that are used in the glass art that you see? Find them on a periodic table.

Notice the different colors around you. Think hard: when white light shines on a surface that you see as a color, what color is reflected and what color is absorbed?

Classroom Activity: Mixing Light

White light is composed of the visible spectrum (red, orange, yellow, green, blue, indigo, and violet), but the human eye has receptors for three colors - red, blue and green. Consequently, all the colors we see are combinations of these three: red + green is yellow, red + blue is magenta, and green + blue is cyan. Red, blue and green are called the ***primary colors of light***. The ***secondary colors of light*** are yellow, cyan and magenta. Colored filters can be used (or a handheld light box designed to manipulate colors of light).

Colored filters allow only the color of the filter to be transmitted, absorbing all the other colors. For example, a blue filter allows blue light through but absorbs red and green. Consequently, a green or red object seen through a blue filter will appear black. Since yellow light is a combination of red + green, a yellow filter will transmit red and green light but block blue. A blue object seen through a yellow filter will appear black.

Colored pigments transmit or reflect the color of the pigment, absorbing all the other colors. For example, a blue marker transmits only blue, absorbing red and green. A mixture of red, blue and green pigments blocks all colors leaving black (or brown depending upon the hue of the colors that are mixed).

Objectives:

To introduce the concept of mixing the color of light using colored filters or a hand held light box.

- To identify primary and secondary colors of light
- To explore how colored filters change the colors of light
- To use colored filters and a hand held light box to understand the colors that are created through additive mixing.

Materials:

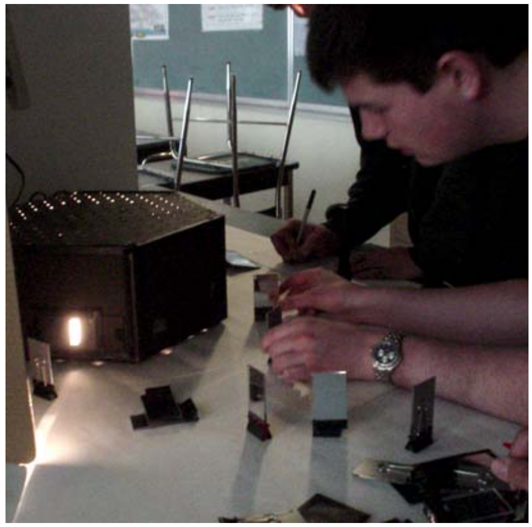
Colored filters in several colors including red, blue, and green, (yellow, cyan and magenta can also be included) or a hand-held light box designed to experiment with mixing colors of light; objects of the primary colors of light (red, blue and green---construction paper can also be used).

Procedures:

1. One way to begin the lesson is to have students brainstorm about what they know about color. Encourage all responses and write on the board or an overhead. Help students understand that the primary and secondary colors of light are <u>different</u> than primary and secondary colors of the color wheel/visual art color theory.

2. Pass out the materials and allow students to explore how they see colored pictures and colored objects through the filters. Encourage students to look through more than one colored filter at a time. Ask students to shine a flashlight through the filters. What happens when a red object is viewed through a blue filter (it appears black)? What about a red object viewed through a red filter (it appears red)? Why does this happen (objects usually absorb light of some frequencies and reflect others---the red object will absorb most frequencies and reflect the red light, and therefore it will be red; when only blue light is shown on a red object, there are no red waves to be reflected, and therefore the object "loses its color?"

3. Share creative results with the class.



To Learn More About Glass Visit:

http://museumofglass.org/education/learn-about-glass/

AND

Try your hand at glassblowing, *virtually*. Learn about the process of taking hot molten glass and creating a work of art. Check out the School by Fire:

http://museumofglass.org/education/virtual-hot-shop/

During

Your Museum Visit

A quick summary of the activities planned for your day at the Museum.

Museum Visit Activities

During the visit to the Museum of Glass students will take part in four sessions:

Theater

Introduction: *Fire Gods*: A Short Animated History of Glass

How has science and technology changed art over time?
How does art reflect history and culture?

Exhibition Gallery

Students engage in a guided inquiry process as they tour the exhibition and record findings in a Reflection Journal.

How do we know an object is glass?
Why do artists choose to make art using glass?
What do you think the artist is trying to communicate? Why?

Hot Shop

The Museum of Glass hot shop provides visitors the opportunity to watch the process of forming molten glass into functional glass and art objects. Students interact with artists and ask questions.

What processes are shared by art and science?
How are artists and scientists alike?
What do artists need to know about science in order to make art with glass?

Studio

Students use interactive science tools and art materials. Students will work with a regional artist to create a hands-on art work that explores the connections between science and art.

Why do scientists conduct experiments?
Why do artists conduct experiments?
How is a hypothesis similar to an artistic vision?

Theater

Students share Science of Art findings recorded in words and images in their Reflection Journals.

What is the importance of art in our world? What is the role of the artist?
What is the importance of science in our world? What is the role of the scientist?
How does art challenge existent beliefs?
How does science challenge existent beliefs?

Classroom Assessment

These post-tour classroom assessment strategies are provided to reinforce student understanding of art and science concepts, processes and interrelationships explored through this program.

Reflect and Describe

What are the primary colors of light? What are the secondary colors of light? What happens when the colors of light are added or subtracted?

Using science vocabulary, describe how light interacted with a work of art to create color.

Design and Communicate

Design a glass sculpture or vessel that has transparent, opaque and translucent color.

Describe how your glass art work will use color and what visual effects it will create or ideas it might communicate.

Connect Art and Science

What is the importance of art in our world? What is the role of the artist?
What is the importance of science in our world? What is the role of the scientist?

Why do artists choose to make art using glass?
What processes are shared by art and science?

How are artists and scientists alike?
What do artists need to know about science in order to make art with glass?

How is a hypothesis similar to an artistic vision?

Resources

Glossary, References, Web Links

and more…

Visual Art Glossary:

2-D or two-dimensional: an object that is flat—having height and width

3-D or three-dimensional: an object that has height, width and depth and can be viewed from multiple points of view

abstract: a work of art exaggerating or simplifying real forms that may or may not be recognizable

balance: equalization of elements in a work of art

color: what the eye sees when a wavelength of light is reflected from a surface

contrast: opposite visual arts qualities placed side by side (e.g., light against dark, heavy against light, textured against smooth, etc.) to create visual interest

creative process: the way that an artist conceptualizes, gathers information, develops skills and techniques, organizes visual elements, reflects, refines and presents a work of art

emphasis: use of contrasts (color, size, shapes) to place greater attention on specific parts of a work of art

form: a three-dimensional object that has height, width and depth

installation: an art work especially arranged and constructed for an exhibit or space—sometimes forming an environment where variables of light, sound and perception of space are manipulated by the artist

line: a mark made with a tool or material across a surface

opaque: a material that absorbs or reflects light, not allowing light to pass through it

pattern: repeating sequence of lines, shapes or colors

relief: a type of sculpture or surface in which forms project from a flat background

rhythm: movement in art created through repetition of elements

sculpture: a three-dimensional work of art

shape: a 2-dimensional enclosed space

space: the area above, below, around, and within a work of art

symmetrical/formal balance: a type of balance that results when both sides of an artwork are the same or mirror one another

technique: methods of working with art materials to create artwork

texture: real or implied tactile characteristics of a surface

translucent: a material that transmits light in diffused directions distorting its path

transparent: a material that transmits light in straight lines without distorting images

unity: wholeness, all elements belonging together in a work of art

value: lightness or darkness of an area of color or tone

variety: diverse elements used together to create visual interest in a work of art

vessel: a container

Science Glossary

absorption: change of electromagnetic energy to other forms of energy as it moves through a medium

additive process: the process where primary colors of light are added together to produce the secondary colors of light

atoms: smallest particle of an element that has all of the element's chemical properties

color: what the eye sees when a wavelength of light is reflected from a surface

cones: the specialized cells in the retina of the eye that are sensitive to color, specifically red, green and blue

diffraction: a light beam bending and spreading out as it moves around an object or through a narrow opening(s)

diffraction grating: a piece of glass or plastic with parallel slots or lines that break white light into the color spectrum

electromagnetic radiation: energy carried through space in the form of waves

frequency: in any periodic motion (such as a wave), the number of complete oscillation in a period of time

incident light: light falling on or striking a surface

light: the portion of the electromagnetic spectrum (electromagnetic radiation with wavelengths from 400 to 700 nanometers) visible to the eye (stimulates the retina of the eye)

molecule: combinations of atoms

opaque: a material that absorbs or reflects light, not allowing light to pass through it

periodic table of the elements: lists all of the different atoms found in nature

pigment: a colored material that absorbs certain colors and reflects or transmits other colors

primary color of light: red, blue and green light

prism: a piece of glass that has equal and parallel ends and sides with parallel edges that disperses white light into the full spectrum of colors.

reflection: rays of light bouncing off a surface

refraction: the bending of a light beam that occurs at the boundary between one material/medium or another

retina: the specialized layer of nerve cells in the eye that are stimulated by light energy

secondary color of light: color formed by a pair of primary colors of light

selective absorption: when one color of white light is reflected, while others are absorbed

spectrum: the band of colors making up white light

subtractive process: the process where primary pigments combine to absorb some colors from white light and reflect or transmit others

translucent: a material that transmits light in diffused directions distorting its path

transparent: a material that transmits light in straight lines without distorting images

wave: a rhythmic disturbance that carries energy through matter or space

wavelength: the shortest distance between points where the wave pattern repeats itself

white light: light from the sun or an artificial source—it appears white but is composed of all of the colors of the spectrum

Glassblowing Glossary

annealer: an insulated box, similar to an electric kiln, designed to cool glass slowly at a specified rate. If hot glass is cooled too quickly, the stress on the glass will cause it to be unstable and through time cause it to break.

batch: a mixture of the basic components of glass (silica, soda, or potash and lime). When heated to its melting point, approximately 2400℉, the mixture becomes glass.

block: a wooden tool that is kept wet and used to shape glass

blowpipe: an iron or stainless steel tube shaped for blowing glass

casting: the process of pouring hot glass into molds of various materials, the simplest being sand. Casting can also be done from the kiln, where the glass starts in a cold state then melted into plaster/silica molds.

cold shop: a workshop with equipment to grind, polish, engrave and/or cut glass and/or to add surface details to finished glass pieces.

furnace: equipment used for melting batch and keeping glass at a constant temperature. The temperature of the furnace ranges from 2150℉ working temperature to 2400℉ charging temperature.

fusing: heating pieces of glass until they bond. This process is achieved within an annealer.

gather: also called a dip. The process of collecting molten glass from the furnace on a pipe, punty or gathering iron.

glory hole: a heavily insulated cylinder, kept between 2100℉ and 2300℉, which is used to reheat hot glass as it is being formed and manipulated in the Hot Shop.

hot shop: a workshop where molten glass is blown, cast or manipulated.

jacks: bladed tools used by glassblowers to shape molten glass. They come in various shapes and sizes to accommodate the work being made.

marver: a large, flat surface on which hot glass is rolled when it is attached to a blowpipe or punty.

pontil or punty: a metal rod that is used to gather a small amount of hot glass, which is then transferred to the object or used to transfer the object making it possible to work the other end.

slump: heating glass so that it softens and changes shape without becoming molten.

tweezers: tong-like tool used to grab or manipulate hot glass.

References & Resources:

Burnie, David. (1992). Eyewitness Science: Light. New York: Dorling Kindersley, Inc.

Curtis, Anthony R. (Ed.) (2003). Space Today Online: Covering Space From Earth to the Edge of the Universe. http://www.spacetoday.org/images/DeepSpace/Telescopes/GreatObservatories/Chandra/ChandraSpectrum.jpg

Deckert, Curt. (2006). Eye Design Book. http://www.eyedesignbook.com/ ch3/eyech3-i.html

Doherty, Paul and Rathjen, Don (Eds.). (1991). The Exploratorium Science Snackbook: teacher created versions of Exploratorium exhibits. San Francisco: The Exploratorium Teacher Institute.

Doherty, Paul and Rathjen, Don (Eds.). (1995). The Magic Wand and Other Bright Experiments on Light and Color. New York: John Wiley & Sons, Inc.

Henderson, Tom. (2004). "Lesson 2: Image Formation in Plane Mirrors." The Physics classroom website: http://www.physicsclassroom.com /Class / refln/U13L2b.html.

Savannah River National Laboratory website (2005). Department of Energy. http://srnl.doe.gov/emsp_news.htm.

Short, Nicholas M. (2006). RST: The Remote Sensing Tutorial. National Aeronautics and Space Administration website. http://rst.gsfc.nasa.gov/ Sect10/originals/Fig10_10.jpg and . . . Sect10/originals/Fig10_11.jpg.

Strickler, Mike. (2006). GeoMania. http://jersey.uoregon.edu/~mstrick/Graphic Pages/Reflection.html.

Su, Weijun (Curator). (2006). Wide Field Camera 3: Hubble's Next Evolution. National Aeronautics and Space Administration website. http://wfc3.gsfc.nasa.gov/MARCONI/images-basic/spectrum.jpg.

Trapp, Dave. (2006). "Primary Colors: Not" Sequim Science. http://homepage.mac.com/dtrapp/ physics.f/Percent.GIF.

Virginia Polytechnic Institute & State University Physics Department website (2003). http://www.phys.vt.edu/~demo/demos/123.html.

Zitzewitz, Paul W., Guitry, Noel D., Kramer, Craig W., Davids, Mark, Hainen, Nicholas O., Nelson, Jane Bray, Nelson, Jim. (2002). Glencoe Physics: Principles and Problems. Columbus, OH: Glencoe/McGraw-Hill.

Credits

Curriculum prepared in partnership with Linda McCone, formerly of Wilson High School, and Meredith Essex, local art educator.

Science of Art is made possible through the generous support of:

- Institute of Museum and Library Services
- The Washington State Arts Commission
- The William W. Kilworth Foundation
- The Baker Foundation
- Qwest