Title of Lesson Plan	Rock and Role
Objective	Students will investigate the physical properties of a variety of rocks and minerals, including color, texture, luster, hardness, and streak. Students will consider how these attributes can be chosen and manipulated for specific uses. Students will learn about ancient stone-working for sculpture, building, tools, and jewelry. Through the "Rock and Role" activity, they will pair rocks and minerals with uses on the basis of physical attributes.
Standards	*National:* *3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.* *Georgia:* *S3E. Obtain, evaluate, and communicate information about the physical attributes of rocks and soils.*
Grade Level	3rd Grade
Pacing	2 sessions
Guiding Questions	What are rocks and minerals and where are they found? How did ancient societies use rocks and minerals? What things do we make from rocks and minerals? How can we observe physical properties of rocks and minerals?
Collection Connection	<u>Objects from the Carlos Museum collection, grouped by stone type:</u> Sandstone: 2005.005.004 – portrait of a Queen 2000.005.001 – seated Buddha Alabaster: 2010.048.001 – amphora 2005.007.002 – vase Limestone: 2006.044.001 – false door 2006.050.001 – statue of Lady Tjerty Granite: 2009.005.001 – head of Amenhotep III 2000.016.001 – Bhairavi

	Carnelian: 2005.045.001– bottle bead necklace 2007.006.001 – crocodile pendant 2009.008.001 – scarab intaglio ring Amethyst: 2005.015.002 – fish amulet 2005.079.001 – scarab necklace Obsidian: 1994.018.044 – spearhead 2003.025.001 – faceted core Basalt: 1991.004.464 – axe head 1991.004.049 – jaguar metate Pigments: 2005.030.001 – portrait of a king 2004.048.001 – Fayum portrait 2005.015.003 – painted stela
Content (About the Artwork and/or connection to the topic)	**Rock and Role; The Role of Rocks and Minerals in Ancient Times** **What are rocks and minerals?** Rocks are solid inorganic materials found naturally in the earth and are made up of minerals. Rocks can be divided into three categories based on how they were formed. Igneous rocks are formed from magma at or below the earth's surface. Sedimentary rocks are formed near the earth's surface from the weathering, transportation, or re-deposition of pre-existing rocks and can include fossils. Metamorphic rocks form when igneous or sedimentary rocks undergo a large amount of pressure and or very high temperature. Minerals are made of a single chemical or combination of elements. They can be divided into categories by their main elements like carbon, silica, or sulfur. **Where are they found?** Where do we find rocks and minerals? Naturally occurring formations and deposits determine where rocks and minerals are found. We can find granite right here in Atlanta while famous Carrara marble comes all the way from Italy. In antiquity, rocks and minerals were traded by societies, much like they are now, but it was slower and harder to transport them. This made it very

	expensive to use materials that were not found locally. Today because of modern technology, we can easily get rocks and minerals from almost anywhere in the world. **How are rocks and minerals used?** How does our society today use rocks and minerals? Rocks and minerals can be found in so many things in our modern society. We use them to build, to make art, and to make jewelry. Minerals can even be found in plaster and in electronics like cell phones and TVs. Ancient societies also used rocks and minerals for many things. Just like us, they used rocks and minerals to build and to create art and jewelry. They also used them to make tools and paint. At the Carlos Museum, you can find objects made from a variety of rocks and minerals from all over the ancient world! **How can we observe physical properties of rocks and minerals?** Rocks and minerals can easily be grouped by their many physical and chemical properties. In this activity, the properties being observed are color, texture, luster, hardness, and streak. The color, texture, and luster all help to describe the appearance of a rock or mineral. The rock or mineral could be one color or have stripes, swirls, and spots of different colors. The texture of a rock or mineral can be smooth, rough, or both at the same time. The luster of a rock or mineral can be shiny like a diamond, dull like a plain pebble, or both. The hardness of a rock or mineral is recorded using something called the Mohs scale. This is a scale from 1-10 that tells us how hard to scratch a material is with 1 being the easiest to scratch and 10 being the hardest to scratch. An example of something with a Mohs hardness of 10 is a diamond. Because they are so hard, diamonds can be used to cut many things like glass (Mohs hardness of 5.5) or even titanium (Mohs hardness of 6). An example of something soft would be chalk, which has a Mohs hardness of 1. This means chalk can be scratched by many things including our fingernail, which have a hardness of 2.5. The streak tells us what color a rock or mineral will be in powder form. We can measure this by dragging a rock or mineral across a ceramic tile. Some streak colors may surprise you!
Project Title	*Rock and Role; The Role of Rocks and Minerals in Ancient Times*

Materials	Penny (1/group) Handheld magnifying glass (1/group) Ceramic streak plates (1/group) Glass (1 2 x 2 in. piece/group) Steel nail (1/group) Carbide drill bite (1/group; can be found at any hardware store) Print-out of Mohs Hardness Scale (1/group) Class set of the following rocks/minerals (most come in packs of 10 from educational science vendors or Amazon): Carnelian Amethyst Limestone Sandstone Alabaster Granite Hematite Azurite or Malachite Obsidian Basalt
Instructions	Week 1: - Introduce rock and mineral properties, sources, and uses including geography, everyday context, and objects from the Carlos Museum collection, using Classroom Presentation. - Walk students through the five physical properties being observed in the lesson through a slide presentation. Students will complete the first question on their worksheet based on this slide. - Guide students through the rocks and minerals activity o Students will be divided into small groups (2-3) and each group will have their own set of 10 rocks and minerals, a streak plate, Mohs hardness kit and magnifying glass. Each group will be assigned an ancient job (sculptor, builder, jeweler, toolmaker, or painter). o Students will observe the color, texture, luster, hardness, and streak for all ten rocks or minerals and record these in their worksheet (question 2). They will then complete 3-5 on their worksheet based on their group's observations. Week 2: - Guide students in a discussion about which rocks or minerals are ideal for each ancient job on the basis of their

	physical attributes through slide presentation and class discussion. - Each student group will present their observations from the previous week as the rest of the class follows along and records these observations in their worksheet (question 6). - Connect these observations to objects from the Carlos Museum collection through slide presentation.
Assessment	See attached worksheet.
Additional Resources (Bibliography, other artwork in the collection, FAQs, books/websites for the classroom, etc.)	http://www.mummies2pyramids.info/geography-cities/egyptian-stone.htm https://www.khanacademy.org/humanities/ancient-art-civilizations/egypt-art/beginners-guide-egypt/a/materials-techniques Rocks: Hard, Soft, Smooth, and Rough by Mandy Ross If you find a rock by Peggy Christian My Book of Rocks and Minerals: Things to Find, Collect, and Treasure by Devin Dennie Other Collection Objects: 2016.014.001 – lioness head 1999.001.015 B – coffin 2005.075.001A/B – Ptah-Sokar-Osiris figurine
Handouts/Worksheets	See attached worksheet.
Vocabulary	Mineral, granite, luster, hardness, texture, streak, rock

Material Suggestions:
Carnelian (20, $22.95): https://www.amazon.com/Carnelian-Natural-Gemstone-Cabochons-Specimen/dp/B07KMC15LK/ref=sr_1_39?keywords=carnelian&qid=1584650720&sr=8-39&th=1

Amethyst (10, $10.79): https://www.schoolspecialty.com/scott-resourcesquartz-amethyst-pack-of-10-587305

Limestone (10, $4.80): https://www.fishersci.com/shop/products/limestone-specimen-sedimentary-rock-2/s26591

Sandstone: (10, $2.60): https://www.fishersci.com/shop/products/sandstone-specimen-sedimentary-rock-2/s26665

Alabaster (6, $12): https://www.fishersci.com/shop/products/individual-mineral-specimen-gypsum-alabaster-white-pink-massive-2/s98871

Granite (10, $5): https://www.fishersci.com/shop/products/granite-specimen-igneous-rock-2/s26609

Hematite (10, $5): https://www.fishersci.com/shop/products/hematite-mineral-specimen-2/p-7076822#?keyword=hematite

Azurite & Malachite (100 g, $7:50): https://www.etsy.com/listing/756620569/azurite-and-malachite-lot-rough-raw?ga_order=price_asc&ga_search_type=all&ga_view_type=gallery&ga_search_query=raw+malachite&ref=sr_gallery-1-4&organic_search_click=1

Obsidian (10, $4.80): https://www.fishersci.com/shop/products/obsidian-specimen-igneous-rock-2/s26587

Basalt (10, $3.60): https://www.fishersci.com/shop/products/basalt-specimen-igneous-rock-2/s26589

Streak plates (10, $8.30): https://www.fishersci.com/shop/products/porcelain-streak-plates-3/s45052#?keyword=hardness+and+streak+minerals

Pennies (10, $0.10): Get roll from bank

Glass (get cut down to 2 x 4 in plates, $2.11): https://www.homedepot.com/p/8-in-x-10-in-x-0-125-in-Clear-Glass-90810/300068240

Steel nails (pack of 80, $1.87): https://www.homedepot.com/p/Everbilt-16-x-1-1-4-in-Stainless-Wire-Nails-1-oz-per-pack-03974/203436472

Carbide drill bits (Set of 3, $6.97 each): https://www.homedepot.com/p/Bosch-Fast-Spiral-Carbide-Tipped-Masonry-Rotary-Drill-Bit-Set-for-Drilling-in-Brick-and-Block-3-Piece-BM4000/301300695

Magnifying glass (class set of 6, $13.20): https://www.fishersci.com/shop/products/magnifier-reading-glass/s23667

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