

A COACH'S GUIDE TO THE ROCKS & MINERALS EVENT

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Introduction to the Participant Notebook

The most important step in preparing for the Rocks and Minerals Event is to have participants design and create very functional notebooks permitting rapid access to pertinent, well-organized information during competitions.

A major goal of the process introduced in this document is for participants to be able to identify, by name, each rock and mineral specimen within 15 to 20 seconds of arriving at a lab station in order to provide maximum time for completing the tasks presented at each station.

A. The 'Rocks and Minerals Event Rules' place no limits on the quantity of text and images that may be included in participant notebooks.

1. Too much content may be as bad as too little, i.e. for efficiency, the notebook must be manageable and easily navigable.
2. Encourage participants to locate, copy and edit internet resources that meet and match the criteria listed in the event rules. Be certain to emphasize the importance of fully comprehending and understanding all information included in their notebooks. *Discourage directly copying and pasting of unedited material from the internet or other resources as such information is of little value during the competition.*
3. It is crucial that all information included in the notebooks be thoroughly researched and developed by the participants themselves.
4. Participant notebooks provide an excellent means for supervisors to monitor participant progress. The thoroughness and functionality of their notebooks may also play a crucial role in the selection of the final participants and alternates for this event.

B. Binder Selection

1. Acquiring a two-inch binder featuring clear, plastic sleeves on both front and back covers is mandatory for the organizational approach advocated in this informational packet.
2. Reference pages, featuring images and page numbers of the rocks and minerals included in the competition, inserted into the sleeves permit rapid location of information relevant to the kinds of questions and activities that may be presented at each station.
3. Participants may refer to the sample reference inserts located toward the back of this informational packet as examples when creating their cover inserts.
4. As you may have noted, all images appearing on the sample inserts are of the same specimen. These images serve as place holders to be deleted and replaced with images found on the web.

C. Recommended design of individual Rock-Mineral Pages to be included in the main part of the notebook: (Refer to the sample pages included at the end of this document.)

1. Encourage participants to create a list of items to include on each page using the Event Rules, prior experience and sample exams as their guide. These pages may be modified with experience and time.
2. Encourage participants to develop a similar format for each rock and mineral page and to standardize placement of that information on each page to permit rapid reference.
3. Suggested items to include on each mineral page
 - a. Labeled image
 - b. Chemical formula
 - c. A list of mineral properties
 - i. Hardness
 - ii. Streak

- iii. Specific gravity.
- iv. Fracture – how a specimen breaks, i.e. conchoidal fracture
- v. Mineral color(s) is often “down-played,” but it can be extremely useful in reducing the possibilities to a limited number of specimens.
- vi. Crystal type
- vii. Luster – how specimen reflects light
- viii. Feel, i.e. graphite feels greasy
- ix. Transmission of light – opaque, transparent, etc.
- x. Texture
- xi. Cleavage, i.e. such as the thin layers of mica

c. Since individual mineral types may vary significantly in appearance, suggest that participants seek out and include a variety of images of each mineral type that illustrate those differences.

d. Commercial use(s)

e. Environment(s) of origin

D. Include an appendix near the rear of the notebook featuring charts and diagrams to illustrate the major features of rocks and minerals. These may include such items as Bowen’s reaction series, crystalline structures, etc. A wide variety of charts, tables, etc., may be found by searching the internet using the phrase ‘minerals and images’. Encourage participants to research and master interpretation of all charts and diagrams they include in their notebooks. A glossary of technical terms along with definitions may also be included in the appendix.

E. Most importantly, do not pass notebooks designed and used in past competitions by former participants on to new participants as creating one’s own unique notebook is absolutely essential to the preparation process.

F. Encourage participants to continually modify/edit the information they have included in their notebooks.

G. It's especially important that participants review and modify the contents of their notebooks according to discoveries noted during actual competitions.

H. The final step is to provide numerous practice sessions using previously administered exam stations.

Front and Rear Cover Design

3. Participants may search for images of each rock and mineral specimen on the web. The instructions below have been included for those individuals who may not be familiar with 'cut-and-paste' techniques.

a. After locating an image you wish to include on the covers of the notebook, begin by clicking on and copying that image.

b. Paste this image into an MS Paint document to permit proper formatting of the image. (Some web images do not require this.)

c. Click on the 'select' button in MS Paint and choose the rectangular selection at the top of the menu.

d. Draw a rectangle surrounding the portion of the image you wish to place on the cover inserts and click 'copy'.

e. Return to the 'Cover' document, delete the image presently on the page and paste the desired image into the appropriate location. Re-size as necessary.

f. Participants may freely copy any of the images included on the Other Worlds Ed Ent, LLC website – <http://otherworlds-edu.net> to place into their documents.

g. As notebooks grow in the number of pages, you must return to the "cover" documents to change the page numbers.

Note: In the event the document you have received has been saved in PDF format, you may create your own by inserting a chart, created in MS Word with a width of six and a height of eight squares.

Criteria for Final Participant Selection

- a. Faithfulness in attending meetings, progress, enthusiasm
- b. Organization, quality, thoroughness of Participant Notebooks
- c. Encourage participation by students over the entire range of ages and abilities
- d. Pairing experienced participants with those who lack experience is a great technique for goals extending beyond the current year.
- f. Individuals who have gained experience through participation in the fossils event have already acquired similar skills.
- g. Build in an allowance for an inevitable drop-out rate, scheduling conflicts, etc.
- h. Avoid the temptation to announce final team members too early for once team member selections have been announced, preparation slows significantly for those selected and will quite likely cease all together for others.

Kit and Individual Specimen Purchases

The quality of specimens students have available for study ties in closely with success in the Rocks and Minerals Event.

1. Low-end kits

- a. Generally include a high number of rather low quality specimens with few distinguishing characteristics
- b. Limited value beyond simple recognition
- c. Least expensive to consumer

2. High-end kits

- a. High quality specimens with many distinguishing characteristics, especially crystalline structures
- b. Other Worlds Ed. Ent., LLC (www.otherworlds-edu.net) is one of few companies that specialize in reasonably priced, high quality kits.

Cautionary note: Minerals specimens are very attractive to students and may easily be 'stolen'. To prevent disappearance of specimens, we sug-

gest you create a 'check out - check-in' system and adhere to that system at all times. Do not leave the specimens in non-monitored areas.

Sample Front Binder Cover

 Albite, Pg.	 Almandine, Pg.	 Amazonite, Pg.	 Apatite, Pg.	 Aragonite, Pg.	 Augite, Pg.
 Azurite, Pg.	 Bauxite, Pg.	 Barite, Pg.	 Beryl, Pg.	 Biotite, Pg.	 Bornite, Pg.
 Calcite, Pg.	 Celestite, Pg.	 Chalcopyrite, Pg.	 Copper, Pg.	 Corundum, Pg.	 Diamond, Pg.
 Dolomite, Pg.	 Epidote, Pg.	 Feldspar, Pg.	 Fluorite, Pg.	 Galena, Pg.	 Goethite, Pg.
 Gold, Pg.	 Graphite, Pg.	 Alabaster, Pg.	 Satin-Spar, Pg.	 Selenite, Pg.	 Halite, Pg.
 Hematite, Pg.	 Hornblende, Pg.	 Kaolinite, Pg.	 Lepidolite, Pg.	 Magnetite, Pg.	 Malachite, Pg.
 Muscovite, Pg.	 Olivine, Pg.	 Opal, Pg.	 Pyrite, Pg.	 Agate/Onyx, Pg.	 Amethyst, Pg.
 Chalcedon, Pg.	 Citrine, Pg.	 Crystal, Pg.	 Jasper, Pg.	 Milky, Pg.	 Rose, Pg.

Rocks & Minerals Resource Notebook

This notebook was created by: _____

Sample Rear Binder Cover

 Rhodonite, Pg.	 Silver, Pg.	 Sodalite, Pg.	 Sphalerite, Pg.	 Staurolite, Pg.	 Sulfur, Pg.
 Talc, Pg.	 Topaz, Pg.	 Tourmaline, Pg.	 Tremolite, Pg.	 Ulexite, Pg.	BEGIN METAMORPHIC ROCKS – Next Row ↙
 Gneiss, Pg.	 Marble, Pg.	 Phyllite, Pg.	 Quartzite, Pg.	 Garnet Schist, Pg.	 Mica Schist, Pg.
 Slate, Pg.	BEGIN IGNEOUS ROCKS – To the Right →	 Andesite, Pg.	 Basalt, Pg.	 Diorite, Pg.	 Gabbro, Pg.
 Granite, Pg.	 Obsidian, Pg.	 Pegmatite, Pg.	 Pumice, Pg.	 Rhyolite, Pg.	 Scoria, Pg.
BEGIN SEDIMENTARY ROCKS – To the Right →	 Anthracite, Pg.	 Arkose, Pg.	 Bituminous, Pg.	 Breccia, Pg.	 Chert, Pg.
 Conglomerate, Pg.	 Coquina, Pg.	 Diatomite, Pg.	 Dolostone, Pg.	 Lignite, Pg.	 Chalk, Pg.
 Crystalline, Pg.	 Fossiliferous, Pg.	 Oolitic, Pg.	 Travertine, Pg.	 Sandstone, Pg.	 Shale, Pg.

Sample Mineral Page: Azurite

Description: Azurite is a soft, deep blue copper mineral produced by weathering of copper ore deposits.

Distinctive Properties: Deep blue color

Chemical Formula: $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$

Specific gravity: 3.7 – 3.9

Class: Carbonates (Azurite is a copper carbonate mineral.)

Color: Blue to very dark blue (copper gives its blue color)

Streak: Light blue

Hardness: 3.5 - 4

Crystal system: Monoclinic. Three axes, all are unequal in length. Two of them are at right angles to each other, while the third lies at an angle other than 90°. It is most frequently seen massive or in nodules.

Transparency: Opaque, translucent in thin splinters

Specific Gravity: 3.7 - 3.9

Luster: Vitreous or dull

Fracture: Conchoidal or splintery

Crystal habit: Tabular, Prismatic, Stalactitic

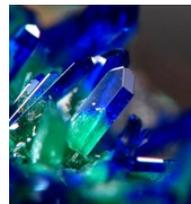
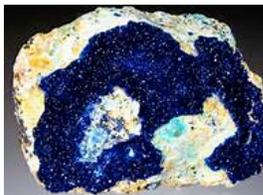
Associated minerals: Malachite, Cuprite, Calcite, Dolomite, Chalcocopyrite

Uses: Dye for paints, fabrics and eye shadow, and in jewelry and ornamental objects.

Other: The instability of azurite is a problem for collectors. If exposed to heat or high humidity, specimen surfaces begin to weather to malachite.

Associated minerals: Azurite is usually found in association with the chemically very similar malachite, producing a striking color combination of deep blue and bright green that is strongly indicative of the presence of copper ores. Azurite may also occur with calcite, chalcocopyrite, copper and limonite. Azurite is often pseudomorphed to malachite, and the two are very frequently found together

Depending upon quality, azurite may take on a variety of appearances:



Sample Rock Page: Basalt

Description: a fine-grained, igneous rock that is usually black or gray in color when not weathered

- an extrusive volcanic rock (formed at or near the surface)
- fine-grained (aphanitic) due to rapid cooling of lava at the surface of a planet
- it may be porphyritic containing larger crystals in a fine matrix
- it may be vesicular with numerous holes; basalt that erupts under open air may form scoria and breccia
- Basaltic cinders are often red, colored by oxidized iron from weathered, iron-rich minerals such as pyroxene.
- The term "mafic," sometimes used to describe basalt, is a short form indicator of the presence of a relatively large concentration of iron and magnesium.

Classification: Basalt is the most common extrusive igneous rock.

Bowen reaction series: Basalt is in a high temperature range of the Bowen reaction series.

Basalt-forming environments: Most basalt found on Earth was produced in three rock-forming environments:

- Oceanic divergent boundaries
- Oceanic hotspots
- Mantle plumes and hotspots beneath continents

Morphology and texture: shape, structure and texture of a basalt is diagnostic of how and where it erupted - whether in the sea, in an explosive eruption, or as creeping pahoehoe lava flows.

Commercial uses: crushed stone, concrete aggregate, railroad ballast, production of high quality textile fibers, floor tiles, acid resistant equipment for heavy industrial use, rock wool, basalt plastic reinforcement bars basalt fiber roofing felt, basalt laminate used as a protective coating, heat-insulating basalt fiber materials, fiber glass

Mineralogy: composed of feldspars, pyroxenes, and olivine



Vesicular Basalt



Columnar Basalt



Extrusive Igneous Rock

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