For Office Use Only:
Part 1: ____ / ____
Part 2: ____ / ____
Score: _____ /150

Team Number: 0

Team Name: KEY

Participant names: _____

_____

2016-2017 **Rocks and Minerals** Exam **KEY**

Princeton Science Olympiad Invitational

Instructions (optional):

1.

a. C A B D **(1 pt. each, 4 total)**

b. Lignite, Bituminous, Anthracite, Graphite **(1 pt. each, 4 total)**

c. A (Bituminous) **(1 pt.)**

d. Soft Coal **(1 pt.)**

e. D (Graphite) **(1 pt.)**

f. Germany **(1 pt.)**

g. B (Anthracite) **(1 pt.)**

h. Since coal is formed from plant debris, "Swamp waters are usually deficient in oxygen, which would react with the plant debris and cause it to decay. This lack of oxygen allows the plant debris to persist. **(2 pts.)** In addition, insects and other organisms that might consume the plant debris on land do not survive well under water in an oxygen-deficient environment." **(1 pts.)**

2.

a.

a. Shale

b. Sandstone

c. Quartzite

d. Granite

e. Slate

f. Gneiss **(1 pt. each, 6 total)**

b.

a. Parent: A Child: E

b. Parent: F Child: D

c. Parent: C Child: B **(1 pt. each pair, 3 total)**

c. The cleavage is through most/all of the rock **(2 pts.)**

d. **Yes** or No **(1 pt.)**

e. Slaty cleavage **(1 pt.)**

f. .01 mm or less **(1 pt.)**

g. Mineral cleavage is related to the internal atomic structure of the mineral while rock cleavage develops from deformation and metamorphism **(2 pts.)**

h. True or **False (1 pt.)**

3.

a. Mica Schist **(1 pt.) (GARNET SCHIST ALSO OK BC SPECIMEN WAS AMBIGUOUS)**

b. Mica **(1 pt.) (OR GARNET OR ALMANDINE)**

c. Medium/intermediate grade **(1 pt.)**

d. Convergent plate boundaries near sedimentary rocks, "deep burial typically associated with the crustal thickening that results from thrust faulting and folding associated with mountain building processes." **(2 pts.)**

e. 1) growth, 2) bending, or 3) rotation of minerals into a parallel orientation. **(1 pt. each, 3 total)**

f. Regional **(1 pt.)**

4.

a. Basalt **(1 pt.)**

b. Pegmatite **(1 pt.)**

c. Felsic **(1 pt.)**

d. Felsic rocks are lighter in color than mafic rocks **(1 pt.)**

e. Typically, felsic rocks are composed of minerals lighter in color. **(1 pt.)**

f. Granite **(1 pt.)**

g. ~69% **(1 pt.)**

h. Aphanitic or Porphyritic depending on the specimen **(1 pt.)**

i. Gabbro **(1 pt.)**

j. B **(1 pt.)**

5.

a. Crystal Quartz **(1 pt.)**

b. Trigonal (Hexagonal also ok) **(1 pt.)**

c. Arkansas (Garland County) and California (NY also acceptable) **(2 pts, 1 for each state)**

d. Krystallos which means "ice" or "icy cold" because they thought it was some type of cooled ice due to its clarity **(2 pts.)**

e. **Yes** or No **(1 pt.)**

f. Felsic **(1 pt.)**

g. Citrine **(1 pt.)**

6.

a. Talc **(1 pt.)**

b. Greasy **(1 pt.)**

c. Vermont **(1 pt.)**

d. Asbestos **(1 pt.)**

e.

Paint filler Linoleum Batteries Lubricants **Soapstone**

Rubber Chalk Wallpaper Bricks

Antiperspirants (1 pt. each, 4 total)

f. China **(1 pt.)**

7.

a. Bornite **(1 pt.)**

b. Chalcopyrite **(1 pt.)**

c. Hematite **(1 pt.)**

d. C **(1 pt.)**

e. A **(1 pt.)**

f. A B **(1 pt. each, 2 total)**

8.

a. Apatite **(1 pt.)**

b. Calcite **(1 pt.)**

c. Fluorite **(1 pt.)**

d. Crystal Quartz **(1 pt.)**

e. D **(1 pt.)**

f. It glows when heated **(2 pts.)**

g. A B **(1 pt. each, 2 total)**

9.

a. Softest: B (Gypsum) **(1 pt.)**

b. A (Sphalerite) **(1 pt.)**

c. D (Topaz) **(1 pt.)**

d. Hardest: C (Corundum) **(1 pt.)**

e. Moh's **(1 pt.)**

f. A **(1 pt.)**

g. Sphalerite **(1 pt.)**

10.

a. Botryoidal (Chalcedony) **(1 pt.)**

b. Orthorhombic (Aragonite) **(1 pt.)**

c. Calcite **(1 pt.)**

d. Chemical comp is the same, crystalline structure (cleavage is included) and hardness is different **(1 pt. each, 3 total)**

e. A pseudomorph is “a mineral or mineral compound that appears in an atypical form (crystal system), resulting from a substitution process in which the appearance and dimensions remain constant, but the original mineral is replaced by another.” **(2 pts.)**

f. Paramorph **(2 pts.)**

11.

a. Augite **(1 pt.)**

b. Hornblende **(1 pt.)**

c. **Yes** or No **(1 pt.)**

d. The cleavages are different **(1 pt.)**

e. B **(1 pt.)**

f. “The continuous branch describes the evolution of the plagioclase feldspars as they evolve from being calcium-rich to more sodium-rich. The discontinuous branch describes the formation of the mafic minerals olivine, pyroxene, amphibole, and biotite mica.” **(1 pt. for continuous and discontinuous, 2 total)**

g. He melted the rock to a magma in a kiln, allowed it to cool slowly to a specific temperature and then cooled it quickly so that no new minerals formed. Then he studied the results under a microscope and chemical analysis. **(3 pts).**

h. Igneous **(1 pt.)**

12.

a.

    a. Clastic- river beds, stream-channel, alluvial fan, lake

    b. Organic- the deep ocean

    c. Organic- coral reefs, lake, ocean shelf, the deep marine **(1 pt. for C/O, 1 pt. for getting at least one of these, 6 total)**

b. Conglomerate **(1 pt.)**

c. Chert **(1 pt.)**

d. Limestone **(1 pt.)**

e. Yes or **No (1 pt.)**

f. Breccia **(1 pt.)**

g. Conglomerates have more rounded sediments/clasts **(1 pt.)**

h. Conglomerates because water makes up a lot of the earth and water transport rounds the sediments. **(2 pts.)**

13.

a. Silicates **(1 pt.)**

b. Plagioclase contains sodium and calcium while orthoclase contains potassium **(2 pts.)**

c. Sulfides **(1 pt.)**

d. They're chemically incompatible **(2 pts.) (other answers acceptable were bowen's, melting point, temperature difference things, mafic/felsic)**

e. Dolostone **(1 pt.)**

f. Barite Gypsum **(1 pt. each, 2 total)**

g. Gypsum **(1 pt.)**

14.