Carbon may be the most important element on our planet because it is the chemical building block of all living things. The element carbon is formed in dying stars and scattered when the stars explode. Our solar system formed from such star remnants. Pure carbon comes in several forms, which include the minerals graphite and diamond (hardness = 10), and the fossil fuels bituminous coal and anthracite coal. Almost all diamonds are mined from igneous rocks that originate at an approximate depth of 150 kilometers under immense pressure. Most graphite is formed through the metamorphism of organic material in rocks closer to Earth's surface.

1. Explain why graphite and diamond have different properties.

2. Identify two uses for the mineral graphite.

3. State the diameter of a particle normally found in rock unit B.

4. Identify two processes that formed rock unit D from sediment.

5. Identify one metamorphic rock that could have formed at the boundary between rock unit E and rock unit H.
6. What observable characteristic could be used to identify this rock sample as gneiss?

7. A dark-red mineral with a glassy luster was also observed in this gneiss sample. Identify the mineral and state one possible use for this mineral.

8. Identify two minerals found in gneiss that contain iron and magnesium.

9. Which mineral shown on the grid would be the best abrasive? State one reason for your choice.

10. On the grid above, construct a bar graph to represent the hardness of these minerals.

11. Base your answer to the following question on the chart below, which shows some physical properties of minerals and the definitions of these properties. The letters A, B, and C indicate parts of the chart that have been left blank. Letter C represents the name of a mineral.

Identify one mineral that could be represented by letter C.
Base your answers to questions 12 and 13 on the diagram below of a mineral classification scheme that shows the properties of certain minerals. Letters A through G represent mineral property zones. Zone E represents the presence of all three properties. For example, a mineral that is harder than glass, has a metallic luster, but does not have cleavage, would be placed in zone. Assume that glass has a hardness of 5.5.

12. State the name of one mineral listed on the Properties of Common Minerals Table that could not be placed in any of the zones.

13. In which zone would the mineral potassium feldspar be placed?
14. Base your answer to the following question on the map and passage below. The map shows the outlines and ages of several calderas created as a result of volcanic activity over the last 16 million years as the North American Plate moved over the Yellowstone Hot Spot. A and B represent locations within the calderas.

The Yellowstone Hot Spot

The Yellowstone Hot Spot has interacted with the North American Plate, causing widespread outpourings of basalt that buried about 200,000 square miles under layers of lava flows that are a half mile or more thick. Some of the basaltic magma produced by the hot spot accumulates near the base of the plate, where it melts the crust above. The melted crust, in turn, rises closer to the surface to form large reservoirs of potentially explosive rhyolite magma. Catastrophic eruptions have partly emptied some of these reservoirs, causing their roofs to collapse. The resulting craters, some of which are more than 30 miles across, are known as volcanic calderas.

Describe the texture and color of the basalt produced by the Yellowstone Hot Spot.
Base your answers to questions 15 through 17 on the diagram below, which represents a part of the cycle. The igneous rock, granite, and the characteristics of sedimentary rock X and metamorphic rock Y are shown.

15. Complete the table below, with descriptions of the observable characteristics used to identify granite.

<table>
<thead>
<tr>
<th>Characteristic of Granite</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texture</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td></td>
</tr>
</tbody>
</table>

16. Identify metamorphic rock Y.

17. Identify sedimentary rock X.
Base your answers to questions 18 through 20 on the data table below, which shows some characteristics of four rock samples, numbered 1 through 4. Some information has been left blank.

<table>
<thead>
<tr>
<th>Rock Sample Number</th>
<th>Composition</th>
<th>Grain Size</th>
<th>Texture</th>
<th>Rock Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>mostly clay minerals</td>
<td>clastic</td>
<td>shale</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>all mica</td>
<td>microscopic, fine</td>
<td>foliated with mineral alignment</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>mica, quartz, feldspar, amphibole, garnet, pyroxene</td>
<td>medium to coarse</td>
<td>foliated with banding</td>
<td>gneiss</td>
</tr>
<tr>
<td>4</td>
<td>potassium feldspar, quartz, biotite, plagioclase feldspar, amphibole</td>
<td>5 mm</td>
<td>granite</td>
<td></td>
</tr>
</tbody>
</table>

18. Write a term or phrase that correctly describes the texture of sample 4.

19. Write the rock name of sample 2.

20. State a possible grain size, in centimeters, for most of the particles found in sample 1.

__________________ cm