Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Mineral Investigation**

**Part 1:**

**Science Phenomenon:** Red diamonds are the most expensive minerals in the world, with a price tag of over $1 million per carat. There are less than 30 of them found around the world, with most of them being less than half a carat. The famous 5.11ct Moussaieff Red Diamond was acquired in 2011 for $8 million and is the largest red diamond discovered in the world. Science

**Investigation Purpose:** You have been hired by the Know-Whin Investment Corporation to determine the value of a mineral deposit located on a piece of land they are considering buying. The Corporation has supplied you with six bags of mineral samples their agents have collected from the land. Your task is to determine the identity of each of the six minerals. Then you will research how valuable each mineral is and report back to the corporation giving your recommendation about whether they should buy the land.

1. Name some minerals you are familiar with: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Why do companies mine minerals? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Why are some minerals valuable while others are not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 2:**

How could you design an experiment to identify a bag of minerals? Explain below by LISTING steps. (Hint: There are at least 8 different steps)

**Part 3** (after the mineral identification lab):

Why can the properties of minerals be used to identify mineral samples? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 4:**

To: Student Mineralogists

From: Know-Whin Investment Corporation

RE: Potential Land Purchase

Dear Mineralogists,

The team of professional excavators we hired determined that the piece of land in question contains the following quantities of minerals:

Calcite: 25,000 kg

Quartz: 30,000 kg

Fluorite: 15,000 kg

Apatite: 500 kg

Gypsum: 100,000 kg

Pyrite: 2,000 kg

If we have to pay $10,000,000 for the land and the average cost of mining 1 kg of minerals is $2.50, should we buy the land? Please respond with an argument for why we should or should not mine, including as much evidence as possible, as well as your reasoning.

Thank you,

Know-Whin Investment Corporation

*Research the price/value of each of the minerals above. The price might be listed per pound, carat, or ton of minerals. Here are some helpful conversions for you to use:*

1 kg = 5,000 carats

1kg = 2.2 pounds

1 ton = 907 kg

|  |  |  |  |
| --- | --- | --- | --- |
| Mineral | Price per unit | Math Conversion | Total Profit Potential |
| Calcite | $40 per ton |  |  |
| Quartz | $20 per kg |  |  |
| Fluorite | $30 per 5,000 carats |  |  |
| Gypsum | $2.50 per kg |  |  |
| Pyrite | $4.50 per pound |  |  |
| Apatite | $75 per carat |  |  |

Cost analysis: Total profit – (cost of property + cost of mining) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - ( \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 5:**

Write a letter back to the Know-Whin Corporation using claim, evidence, and reasoning to argue FOR and AGAINST the purchase of the land, citing evidence.

KEY:

|  |  |  |  |
| --- | --- | --- | --- |
| Mineral | Price per unit | Math Conversion | Total Profit Potential |
| Calcite | $40 per ton |  | $1,000 |
| Quartz | $20 per kg |  | $600,000 |
| Fluorite | $30 per 5,000 carats |  | $450,000 |
| Gypsum | $2.50 per kg |  | $250,000 |
| Pyrite | $4.50 per pound |  | $19,800 |

Apatite $75 per carat $187,500,000

Cost analysis: Total profit – (cost of property + cost of mining) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

$188,820,800 - ($10,000,000 + $431,250) = $178,389,550

\*Challenge: if it takes $3,500 per acre to ‘reclaim’ the land after mining, how many maximum acres could the land be?

1. Take out the test materials and minerals and organize them.
2. Pick a mineral and examine it’s color by using your eyes.
3. Test streak by rubbing the mineral on the white streak plate. If the streak color is white, test it on your desk.
4. Test special properties with magnet to see if mineral is magnetic. Then test acidity with acid.
5. Test hardness by completing the following:
	1. Scratch fingernail. If it scratches it is harder than 2.5 then continue.
	2. Scratch copper. If it scratches it is harder than a 3 then continue.
	3. Scratch glass. If it scratches it is harder than 5.5-6.
6. Test luster by putting it under a light to see if it shines.
7. Test density by weighing it in your hand (mass/volume).
8. Test crystal structure by looking at it with a magnifying glass.
9. Test breakage by looking at it to see if it has cleavage (smooth faces) or fracture (jagged).
10. Repeat with all minerals.