Alternative methods of metal extraction: Worksheet 10.5.2

Mining, phytomining and bioleaching

1. The diagram shows how bioleaching is used to extract copper.

Bacteria grown on low-grade ore

Low-grade copper ore

Leachate solution containing Copper metal

copper compounds electrolysis

or displacement

a. Explain how bioleaching is used to extract copper metal.

b. The bacteria change copper sulfide to copper sulfate in the ore. Which is soluble and which is insoluble?

2. Use the information in the table to explain why phytomining and bioleaching may be the methods of the future in the copper mining industry.

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|  | **Traditional mining** | **Phytomining** | **Bioleaching** |
| Environmental factors | Large open cast mines, create waste rock; smelting involves production of sulfur dioxide | Requires land use; involves burning, but heat produced could be used to generate electricity | Can also produce toxic chemicals that enter water supplies; needs careful monitoring |
| Economic factors | Currently the cheapest method | Currently more expensive than traditional mining, but this could change if copper prices rise and higher grade ores are used up | Slow process, so very expensive |
| Other factors | Copper produced has to be purified by electrolysis | Dependent on plant growth, so can be seasonal; plants can be prone to disease; plants with high metal content can enter the food chain |  |