Section A:

1. Match each key word with the correct definition.

Mining	An extraction method that uses plants to absorb metal compounds that are harvested and then burned to produce ash that contains metal compounds.
Phytomining	The digging and moving of rock from the Earth.
Bioleaching	A process that uses bacteria to produce leachate solutions that contain metal compounds.

2. Complete the gaps below.

Low-grade ores contain a very low percentage of the _____ to be extracted. To extract copper from low-grade copper ores, _____ and _____ can be used.

3. Describe the effect that mining for ore has on the environment.

_____

_____

4. Explain why copper ores are described as being non-renewable.

_____

5. State one similarity of phytomining and bioleaching.

_____

6. Explain why copper ores are becoming more expensive over time.

_____

_____

7. Copper compounds can be extracted from ores.

Describe two methods used to extract copper from copper compounds.

1. _____

_____

2. _____

_____

Section B

1. Explain why methods to obtain copper from low-grade ores have been developed.

2. Phytomining can be used to obtain copper from low-grade ore in land.

   Describe how copper compounds are obtained by phytomining.

3. State a waste gas product made during the phytomining process and explain the environmental impact of this.

4. Suggest one reason why phytomining is preferable to mining the land for obtaining copper ores.

5. State one reason why copper should not be disposed of in landfill sites.

Section C

The greatest demand for copper is in electrical wiring.

Copper can be extracted from low-grade ores such as chalcocite, which contains copper sulfide.

1. Copper is used for electrical wiring.

   State two properties of copper that make it ideal for electrical wiring.
   1. _____
   2. _____

2. Write the compound formula for copper sulfide. _____

3. Copper can be extracted from copper sulfide by heating to over 1000ºC in a furnace and then blowing in air. Fossil fuels are burned to heat the furnace.

   Sulfur dioxide is a product of this reaction.

   (a) Write a balanced word equation for this reaction.

   _____

   (b) Suggest an environmental impact this process will have.

   _____

4. Bioleaching was used to produce a leachate from chalcocite. The leachate contained copper sulfate solution.

   (a) Define 'leachate'.

   _____

   (b) Electrolysis of the copper sulfate solution can be carried out to obtain pure copper.

   At which electrode would you expect to see copper forming? Explain your answer.

   _____

   _____

   _____

5. Phytomining is not used as frequently as bioleaching to extract copper ores.

   Suggest one reason why.

   _____