unsightly / noise / destroy wildlife habitats

landfill

Teacher modelled question

Copy the modelled answer down.

Read the information about the production of uranium.

Uranium oxide is used in nuclear reactors. Around 75,000 tonnes of uranum oxide is needed every year. Traditional mining methods such as underground mines and open cast mines supply around 20,000 tonnes of uranium oxide per year.

conserving supply ↑

In traditional mining techniques, the uranium ores are crushed and pulverised into very fine fragments. Water is added to make a slurry. This is mixed with sulfuric acid. A precipitate of uranium oxide forms. This is not very pure and needs to be enriched. This process involves a lot of energy. Large amounts of waste rock slurry are produced.

global warming ↑

fossil fuels – non-renewable – CO_2 – greenhouse gas

recycle used ore

The remaining 55,000 tonnes of uranium is extracted from low-grade ores or previously used ore by bioleaching. In bioleaching bacteria oxidise Fe^{2+} and S^{2-} ions. This leads to the formation of sulfuric acid which can then break down the uranium ore into soluble uranium ions.

cheaper (+) readily available bacteria (natural) (−) slow produces toxic substances.

low concentration of U, not cost effective with trad methods.

Explain why more uranium is produced by bioleaching than traditional mining techniques. (6 marks)

Traditional mining methods are unsightly, produce lots of noise pollution and destroy wildlife habitats. They extraction of uranium via this method produces lots of rock slurry as waste, which requries lots of landfill for disposal. The enrichment process requries lots of energy, meaning lots of fossil fuels will be burnt. Fossil fuels are non-renewable which means they will run out. Burning fossil fuels makes carbon dioxide which is a greenhouse gas. This will lead to an increase in global warming. This is why less than a third of uranium (20,000 tonnes) is extracted this way.

Bioleaching can be used with low grade ores and previously used ore. Recycling ore will conserve supplies. Bioleaching is cheaper and more cost effective with low grade ores compared to traditional methods. The bacteria needed is found naturally. Although bioleaching is slow and produces toxic substances it is overall better than traditional mining. This is why more uranium (55,000 tonnes) is extracted this way.