Q14

In the context of solving pollution problems, what is/are the advantage/advantages of bioremediation technique? 1. It is a technique for cleaning up pollution by enhancing the same biodegradation process that occurs in nature. 2. Any contaminant with heavy metals such as cadmium and lead can be readily and completely treated by bioremediation using microorganisms. 3. Genetic engineering can be used to create microorganisms specifically designed for bioremediation. Select the correct answer using the code given below: (a) 1 only (b) 2 and 3 only (c) 1 and 3 only (d) 1, 2 and 3 Official key: C.

UPSC Civil Services Prelims 2017 · General Studies · 2 marks · Environment and Ecology

Environment, ecology, climate, biodiversity - Prelims GS Paper I.

Explanation

(a)

(a) 1 only. Statement 1 is true - bioremediation speeds natural biodegradation - but statement 3 on engineered microbes is also true, so 1 only is incomplete.

(b)

(b) 2 and 3 only. Statement 2 is false: heavy metals are not readily and completely removed by ordinary microbial biodegradation the way organics are. So this code is not the key.

(c) Official key

(c) 1 and 3 only. Bioremediation uses and can enhance natural breakdown; genetic engineering can design specialist degraders. Metals such as cadmium and lead are not 'readily and completely' treated by microbes. This is the official key.

(d)

(d) 1, 2 and 3. The metal claim knocks out all three.

Summary

Official key is (c) 1 and 3 only. Bioremediation cleans polluted soil or water by boosting bacteria, fungi or plants that already degrade contaminants. Designer microbes (for example oil-eating strains) are a recognised genetic-engineering use. Heavy metals are elements; microbes may change their speciation or immobilise them, but they are not readily and completely 'eaten' the way hydrocarbons are. Phytoremediation is the neighbouring plant-based tool.

Related possible facts

These can be asked in a future Prelims paper.

In situ vs ex situ
Treat on site or after excavation

Oil spills
Classic bioremediation case

Pseudomonas
Often cited hydrocarbon degraders

Heavy metals
Need immobilisation / phytoextraction

Bioaugmentation
Adding cultured microbes

Biostimulation
Adding nutrients/oxygen to native microbes