

Answer the Following Questions:

Question ONE:

(25 marks)

Choose the Correct Answer

- 1- The most critical limitation of traditional biotechnology compared with modern biotechnology lies in its inability to
(manipulate genetic material) (exploit microbial metabolism) (use fermentation) (apply biological agents)
- 2- Bioremediation is distinguished from natural biodegradation because it involves
(spontaneous microbial action) (chemical detoxification) (human-controlled enhancement) (physical excavation)
- 3- One major ecological advantage of biotechnological remediation is its ability to
(isolate contaminants) (permanently remove elements) (transform pollutants biologically) (neutralize ecosystems)
- 4- Biofilm formation on metal surfaces can paradoxically reduce corrosion because biofilms
(consume oxygen) (block reactive sites) (secrete acids) (dissolve minerals)
- 5- An ecosystem is functionally defined by
(species richness alone) (climate parameters only) (biotic–abiotic interactions) (geographic boundaries)
- 6- Chemosynthetic organisms differ ecologically from photosynthetic producers because they
(require organic carbon) (use chemical energy) (lack enzymes) (consume detritus)
- 7- The biosphere's primary function in global systems is
(atmospheric regulation) (mineral cycling) (biological circulation of energy and matter) (climate stabilization)
- 8- Mineralization within biogeochemical cycles results in
(organic compound synthesis) (inorganic nutrient release) (biomass accumulation) (energy storage)
- 9- The role of biotechnology in environmental protection is BEST described as
(reactive only) (preventive and restorative) (theoretical) (regulatory)
- 10- Microorganisms capable of degrading polymers are important because polymers are
(highly biodegradable) (persistent environmental pollutants) (inorganic materials) (volatile compounds)
- 11- The success of activated sludge systems depends heavily on
(sedimentation rate) (microbial community structure) (chemical additives) (absence of oxygen)
- 12- Marine oil spills are particularly damaging because they
(evaporate rapidly) (disrupt ecological and socioeconomic systems) (sink harmlessly) (degrade instantly)
- 13- Ecobiotechnology contributes to sustainable construction mainly by
(increasing material extraction) (preventing microbial corrosion) (promoting waste reuse) (eliminating biofilms)

- 14- The introduction of aeration systems in wastewater treatment reduced processing time by (inhibiting anaerobes) (increasing microbial oxidation rates) (removing sediments) (lowering nutrient loads)
- 15- In-situ bioremediation is limited mainly by (lack of microbes) (subsurface control difficulty) (high cost) (nutrient toxicity)
- 16- Bioremediation success depends LEAST on (microbial population) (nutrient availability) (public policy) (environmental conditions)
- 17- Which of the following urban waste is not categorized as toxic waste? (Old medicines) (Paints) (Fertilizer) (Agricultural wastes)
- 18- At this stage of the mechanism, molecules enter inside the microbial cells, and metabolic reactions produce energy (ATP): (Mineralization) (Assimilation) (Biofragmentation) (all the previous are not true)
- 19- Which among the following is not considered the principal environmental factor? (pH) (Temperature) (Soil type) (Pressure)
- 20- Industrial waste volume surpasses household waste mainly due to (population density) (continuous industrial processing) (inefficient recycling) (chemical toxicity)
- 21-) One major advantage of biodegradation over physical remediation is that it (requires less time) (is irreversible) (eliminates contaminants permanently) (produces no by-products)
- 22- Biodeterioration facilitates biodegradation by (mineralizing pollutants) (weakening material structure) (generating ATP) (forming monomers)
- 23- Assimilation in microbial metabolism results primarily in (pollutant accumulation) (cell growth and energy production) (mineral formation) (toxin release)
- 24- The greenhouse effect becomes problematic when (autotrophy exceeds heterotrophy) (CO₂ accumulation increases) (oxygen declines) (nitrogen increases)
- 25- The effectiveness of bioremediation is MOST directly constrained by (microbial adaptability) (contaminant bioavailability) (public awareness) (historical land use)

Question Two:

(20 marks)

A- Put ✓ or × and correct the false

- 1) Organic pollutants are persistent and can not be degraded in the environment by natural processes.
- 2) The food transformation is a traditional biotechnology.
- 3) The air composition is stable in all parts of the atmosphere.
- 4) Bioremediation can be effective only where environmental conditions permit microbial growth and activity.
- 5) Biotic factors in the natural environment depend on external factors such as temperature and humidity.
- 6) Oxides of nitrogen and Sulphur lead to significant air pollution
- 7) Scientists are working on a new type of activated sludge for air purification
- 8) Traditional biotechnology depends mainly on recombinant DNA technology
- 9) Environmental biotechnology focuses on environmental exploitation
- 10) Environmental biotechnology has no role in air pollution control.
- 11) Sulfate-reducing bacteria can contribute to metal corrosion
- 12) Decomposers convert organic matter into simpler substances
- 13) Biotic factors include soil minerals and water.

- 14) Biodegradation depends only on physical processes.
- 15) Aromatic hydrocarbons are easily biodegradable.
- 16) Biodeterioration is the final stage of biodegradation
- 17) Injection wells supply oxygen and nutrients.
- 18) Biotechnology reduces pollution mainly by dilution.
- 19) Composting reduces microbial activity
- 20) Fossil fuel combustion releases sulfur oxides

Question Three:

(15 marks)

A- Answer the following items:

(7 marks)

- 1- Compare biodegradation and bioremediation.
- 2- Discuss the Mechanism of Biodegradation

B- Complete the missing parts:

(8 marks)

- The rate of application of new aspects of biotechnology will depend on.....(1).....
- The three main layers of biosphere are(2).....
- Biotopes are divided into(3).....
- Factors influencing bioremediation processes are ...(4)...
- Ex-situ bioremediation involves...(5)...contaminated material for treatment.
- Long-term remediation success requires continuous ...(6)... and monitoring
- In-situ bioremediation occurs ...(7)... the site of contamination
- Anabolism involves the...(8)... of complex cellular components

End of questions

With Best Wishes

Wael S. El Tahamy

Head of Department: Prof. Dr. Ayman Hyder