

Microbes in Human Welfare — NEET MCQs with Solutions

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Q1. Which microorganism mentioned in NCERT converts milk into curd?

- (A) Lactobacillus species
- (B) Saccharomyces cerevisiae
- (C) Methanobacterium
- (D) Azotobacter

Q2. Which milk protein coagulates during curd formation due to lactic acid production?

- (A) Lactalbumin
- (B) Lactoglobulin
- (C) Whey protein
- (D) Casein

Q3. Which preparation difference most accurately distinguishes idli from dosa, given that both originate from similar fermented batter?

- (A) Idli batter is fried; dosa is steamed
- (B) Idli is steamed; dosa is cooked on hot surface
- (C) Dosa batter contains only wheat flour
- (D) Idli batter contains only rice starch

Q4. Which of the following correctly identifies why bread made with yeast has a different texture than unleavened bread (chapati)?

- (A) Yeast produces lactic acid that softens gluten strands
- (B) Yeast breaks down gluten completely, reducing elasticity
- (C) CO₂ produced by yeast creates air pockets giving spongy texture; chapati has none
- (D) Yeast adds glucose to dough increasing sweetness and softness

Q5. Which microorganism produces the antibiotic penicillin?

- (A) Aspergillus niger
- (B) Rhizobium leguminosarum
- (C) Lactobacillus acidophilus
- (D) Penicillium notatum

Q6. Which microorganism is used to produce acetic acid from ethanol during vinegar production?

- (A) Saccharomyces cerevisiae
- (B) Acetobacter aceti
- (C) Penicillium notatum
- (D) Methanobacterium

Q7. Which bioactive molecule is used as an immunosuppressant during organ transplantation?

- (A) Lovastatin
- (B) Cyclosporin A
- (C) Tetracycline
- (D) Streptokinase

Q8. Which microorganism produces lovastatin (a statin) used for lowering blood cholesterol?

- (A) *Monascus purpureus*
- (B) *Trichoderma polysporum*
- (C) *Streptococcus* species
- (D) *Aspergillus fumigatus*

Q9. Which step of sewage treatment primarily removes large floating solids and suspended particles through physical processes?

- (A) Primary treatment
- (B) Secondary treatment
- (C) Tertiary treatment
- (D) Anaerobic digestion

Q10. A small portion of activated sludge is recycled back into the aeration tank. What is the specific purpose of this recycling?

- (A) To increase the BOD of incoming sewage
- (B) To supply oxygen to the aeration tank
- (C) To neutralise the pH of effluent
- (D) To serve as inoculum and maintain an active microbial population in the aeration tank

Q11. A river downstream of an untreated sewage discharge point shows a sudden mass death of fish. Which of the following is the most likely ecological explanation?

- (A) Sewage introduced excess mineral salts toxic to fish
- (B) Microbial decomposition of high-BOD sewage depleted dissolved oxygen below survival threshold for fish
- (C) Sewage lowered water temperature killing fish
- (D) Sewage introduced predatory microorganisms that attacked fish directly

Q12. Which of the following best explains why flocs are critical to the efficiency of secondary sewage treatment?

- (A) They chemically neutralise acidic effluent
- (B) They produce oxygen to support anaerobic bacteria
- (C) They create a large surface area and concentrated microbial biomass for rapid organic matter degradation
- (D) They physically trap heavy metals preventing their release

Q13. Which group of microorganisms is primarily responsible for biogas production from organic waste?

- (A) Methanogens
- (B) Nitrifying bacteria
- (C) Lactic acid bacteria
- (D) Cyanobacteria

Q14. Which component besides methane is commonly present in significant amounts in biogas?

- (A) Oxygen
- (B) Nitrogen
- (C) Ammonia
- (D) Carbon dioxide

Q15. Which condition would most effectively inhibit methanogen activity and halt biogas production?

- (A) Neutral pH around 7
- (B) Presence of cellulosic organic waste
- (C) Temperature of 35°C
- (D) Introduction of oxygen into the digester

Q16. Which of the following correctly explains why methanogens are classified under Archaea rather than Bacteria, despite both being prokaryotes?

- (A) Methanogens have a membrane-bound nucleus
- (B) Methanogens perform aerobic respiration
- (C) Methanogens reproduce by meiosis
- (D) Methanogens lack peptidoglycan in their cell walls and possess unique archaeal membrane lipids

Q17. What is the primary purpose of using biocontrol agents in agriculture?

- (A) Control pests using living organisms
- (B) Increase soil mineral content
- (C) Accelerate fossil fuel formation
- (D) Synthesise chemical fertilisers

Q18. Which type of virus is used as a biological control agent specifically against insect pests?

- (A) Baculovirus
- (B) Tobacco mosaic virus
- (C) Retrovirus
- (D) Adenovirus

Q19. Which of the following organisms act as antagonists suppressing plant-pathogenic fungi in rhizosphere soil?

- (A) Methanogens
- (B) Trichoderma species
- (C) Cyanobacteria
- (D) Rhizobium species

Q20. Which property of baculoviruses distinguishes them from chemical insecticides in terms of ecological risk?

- (A) Rapid mutation enabling broad infectivity
- (B) Narrow host range; safe for non-targets
- (C) Ability to persist indefinitely in soil
- (D) High toxicity to vertebrates

Q21. Which plant structure develops specifically as a result of Rhizobium infection in leguminous roots?

- (A) Lateral root branches
- (B) Mycorrhizal sheaths
- (C) Root hair elongation
- (D) Root nodules

Q22. Which group of organisms acts as photosynthetic nitrogen-fixing biofertilisers used widely in paddy fields?

- (A) Decomposer fungi
- (B) Nitrifying bacteria
- (C) Cyanobacteria
- (D) Mycorrhizal fungi

Q23. Which fungal genus most commonly forms arbuscular mycorrhizal (AM) associations with plant roots?

- (A) Rhizopus
- (B) Penicillium
- (C) Trichoderma
- (D) Glomus

Q24. Which of the following correctly explains why leghaemoglobin is essential for nitrogen fixation in root nodules?

- (A) It transports fixed nitrogen to the shoot system
- (B) It provides the iron cofactor required by nitrogenase directly
- (C) It buffers O_2 at a low, steady level — protecting nitrogenase while supplying O_2 for Rhizobium's respiration
- (D) It produces ATP required for the high energy cost of N_2 fixation

Answer key and explanations

Q1. Answer: (A) Lactobacillus species

Lactobacillus (LAB) ferments lactose in milk, producing lactic acid that lowers pH and causes coagulation. Saccharomyces is a yeast involved in bread/alcohol fermentation, not curd. Methanobacterium and Azotobacter have no role in curd formation.

Q2. Answer: (D) Casein

Lactic acid lowers pH to the isoelectric point of casein (~4.6), causing it to precipitate and form curd. Lactalbumin and lactoglobulin are whey proteins that remain in solution and do not coagulate under these conditions.

Q3. Answer: (B) Idli is steamed; dosa is cooked on hot surface

Both idli and dosa use fermented rice and black gram batter, but idli is steamed into soft cakes while dosa batter is spread thin and cooked on a hot griddle. Neither uses wheat flour exclusively, and black gram is present in both.

Q4. Answer: (C) CO_2 produced by yeast creates air pockets giving spongy texture; chapati has none

CO_2 trapped in the gluten network during yeast fermentation creates air pockets, giving leavened bread its characteristic spongy, porous texture. Unleavened bread (chapati) has no such CO_2 entrapment. Yeast does not produce lactic acid or break down gluten.

Q5. Answer: (D) Penicillium notatum

Penicillium notatum (fungus) produces penicillin, which inhibits bacterial cell wall synthesis. Aspergillus niger produces citric acid; Rhizobium is a nitrogen fixer; Lactobacillus produces lactic acid — none produce penicillin.

Q6. Answer: (B) Acetobacter aceti

Acetobacter aceti oxidises ethanol to acetic acid under aerobic conditions — this is the biochemical basis of vinegar production. Saccharomyces produces ethanol; Penicillium produces penicillin; Methanobacterium produces methane.

Q7. Answer: (B) Cyclosporin A

Cyclosporin A, produced by Trichoderma polysporum, suppresses the recipient's immune response, preventing organ rejection after transplantation. Lovastatin is a statin (cholesterol-lowering); tetracycline is an antibiotic; streptokinase is a clot-buster.

Q8. Answer: (A) Monascus purpureus

NCERT states that Monascus purpureus (a yeast) produces statins, including lovastatin, which competitively inhibit HMG-CoA reductase — the enzyme for cholesterol synthesis in the liver. Trichoderma produces cyclosporin A; Streptococcus produces streptokinase.

Q9. Answer: (A) Primary treatment

Primary treatment uses sequential filtration (removal of large debris) followed by sedimentation in settling tanks to remove suspended particles — no biological agents are involved. Secondary treatment uses microbes; tertiary treatment targets dissolved chemicals; anaerobic digestion treats sludge.

Q10. Answer: (D) To serve as inoculum and maintain an active microbial population in the aeration tank

The recycled portion seeds the incoming sewage with active microorganisms (inoculum), ensuring rapid biological degradation begins immediately without a lag phase. It does not supply oxygen, adjust pH, or increase BOD — aeration serves the oxygen function.

Q11. Answer: (B) Microbial decomposition of high-BOD sewage depleted dissolved oxygen below survival threshold for fish

Untreated sewage has very high BOD; when discharged, microbes decompose this organic matter consuming dissolved oxygen rapidly. Dissolved oxygen drops below the minimum needed for fish survival. Temperature drop, mineral toxicity, and microbial predation are not the primary mechanism of BOD-related fish kills.

Q12. Answer: (C) They create a large surface area and concentrated microbial biomass for rapid organic matter degradation

Flocs — mesh-like masses of bacteria and fungal filaments — concentrate microbial biomass and present large surface area, dramatically increasing the rate of organic matter degradation. This distinguishes secondary treatment efficiency from purely physical or chemical methods. Option B is self-contradictory (flocs support aerobic, not anaerobic, bacteria).

Q13. Answer: (A) Methanogens

Methanogens anaerobically convert organic substrates — especially cellulosic material in cow dung — into methane, the primary component of biogas. Nitrifying bacteria oxidise ammonia to nitrate and play no role in methanogenesis. Lactic acid bacteria and cyanobacteria are aerobic/facultative and do not produce methane.

Q14. Answer: (D) Carbon dioxide

Biogas is composed primarily of methane and carbon dioxide. CO_2 is produced as a co-product during anaerobic oxidation of organic matter. Oxygen is absent (anaerobic process); nitrogen and ammonia are not significant gaseous products of methanogenesis.

Q15. Answer: (D) Introduction of oxygen into the digester

Methanogens are obligate anaerobes — introduction of oxygen irreversibly inhibits their enzymatic machinery, stopping methanogenesis. Neutral pH (~ 7), cellulosic substrate, and 35°C are all optimal, not inhibitory, conditions for biogas production.

Q16. Answer: (D) Methanogens lack peptidoglycan in their cell walls and possess unique archaeal membrane lipids

Archaea differ from Bacteria in three key biochemical features: absence of peptidoglycan (replaced by pseudomurein), ether-linked membrane lipids (vs ester-linked in bacteria), and distinct ribosomal RNA sequences. All three features apply to methanogens. Options A, B, and C describe eukaryotic or incorrect properties.

Q17. Answer: (A) Control pests using living organisms

Biocontrol is defined as the use of living organisms — microbes, predators, or parasites — to suppress pest populations below economically damaging levels, without synthetic chemicals. The other options describe unrelated agricultural or industrial processes.

Q18. Answer: (A) Baculovirus

Baculoviruses (Nucleopolyhedroviruses) infect and kill arthropods — particularly lepidopteran larvae — and are used as bioinsecticides. TMV infects plants; retroviruses and adenoviruses infect vertebrates. Baculoviruses are completely safe for mammals, birds, and plants.

Q19. Answer: (B) Trichoderma species

Trichoderma species are free-living soil fungi that colonise the rhizosphere and suppress plant-pathogenic fungi (Pythium, Fusarium, Rhizoctonia) through mycoparasitism, antibiosis, and competition for nutrients. Methanogens produce biogas; cyanobacteria fix nitrogen; Rhizobium fixes nitrogen in root nodules — none suppress fungal pathogens.

Q20. Answer: (B) Narrow host range; safe for non-targets

Baculoviruses have species-specific attachment proteins that bind only to receptors on target insect cells, making them incapable of infecting vertebrates, plants, or beneficial insects. Chemical insecticides lack this specificity. Option A (rapid mutation → broad infectivity) is a strong distractor but describes RNA viruses, not baculoviruses.

Q21. Answer: (D) Root nodules

Rhizobium enters root hairs and stimulates cortex cells to divide, forming root nodules — specialised structures where N_2 fixation occurs. Lateral roots arise from pericycle, not microbial infection. Mycorrhizal sheaths are formed by fungi, not bacteria.

Q22. Answer: (C) Cyanobacteria

Cyanobacteria (BGA) such as Anabaena and Nostoc are unique — they perform both oxygenic photosynthesis and biological N_2 fixation. This dual function makes them ideal biofertilisers for rice paddies. Nitrifying bacteria oxidise but do not fix N_2 .

Q23. Answer: (D) Glomus

Glomus is the most well-studied AM fungal genus, forming arbuscules inside root cortex cells. Rhizopus and Penicillium are saprophytic moulds; Trichoderma is used as a biocontrol agent, not a mycorrhizal symbiont.

Q24. Answer: (C) It buffers O_2 at a low, steady level — protecting nitrogenase while supplying O_2 for Rhizobium's respiration

Leghaemoglobin acts as an O_2 buffer — it has high affinity for O_2 , keeping free O_2 concentration very low (protecting O_2 -sensitive nitrogenase) while releasing it slowly for Rhizobium's aerobic respiration. Option B is a trap: nitrogenase uses a MoFe cofactor, but leghaemoglobin supplies O_2 , not iron directly.

Microbe and product: quick revision table

Microbe	Product or use
Lactobacillus (lactic acid bacteria)	Curd; lactic acid
Saccharomyces cerevisiae (baker's / brewer's yeast)	Bread dough; ethanol
Propionibacterium sharmanii	Large holes in Swiss cheese
Penicillium notatum	Penicillin, the first antibiotic (Alexander Fleming)
Aspergillus niger	Citric acid
Acetobacter aceti	Acetic acid (vinegar)
Clostridium butylicum	Butyric acid
Streptococcus	Streptokinase, a clot buster
Trichoderma polysporum	Cyclosporin A, an immunosuppressant
Monascus purpureus	Statins, which lower blood cholesterol
Methanobacterium (methanogens)	Biogas, mainly methane
Bacillus thuringiensis	Bt toxin against insect pests
Baculoviruses (Nucleopolyhedrovirus)	Narrow-spectrum biological insecticide
Rhizobium	Nitrogen fixation in root nodules of legumes
Glomus (mycorrhiza)	Phosphorus absorption from soil
Anabaena, Nostoc, Oscillatoria (cyanobacteria)	Nitrogen fixation in paddy fields