	Assiut University- Faculty of Science First Semester- Final Exam 2025-2026 Botany and Microbiology Department	Program: Microbiological science Level : (2 & 3) Date: 17/5/2026 Time: 2 h	
Course Title: Microbial Ecology (Part 2)		Code: B 494	
Instructors: Prof. Dr. Fatthy Mohamed Sayed Morsy Dr. Somaya Mahmoud Mohammed Nassar			
No. of pages: 13 Part I: 5 Part II: 8	Part I and Part II Answer in a bubble sheet	Total No. of Points: 50 Part I: 25 Points (1-25) Part II: 25 Points (26-50)	Total Marks: 50 Part I: 25 Part II: 25

Part II: Choose the Correct Answer (25 Points)

(Answer in a bubble sheet. Each question is worth one mark.)

26) Which factor is noted for allowing viruses to survive longer in water environments?

A) High UV exposure

B) Cold water temperatures

C) High pH levels

D) Intense water movement

27) Under high nutrient conditions, excess nitrogen and phosphorus can lead to which phenomenon?

A) Increased viral shunt

B) Quorum sensing

C) Eutrophication and harmful algal blooms

D) Deep-sea hydrothermal vent formation

28) In a wastewater treatment plant, what is the primary role of the "activated sludge" process?

A) Using microorganisms to break down organic waste

B) Removing microbes through UV disinfection

C) Filtering out microplastics from the water

D) Producing drinking-grade water through coagulation

29) Why are biofilms in water distribution pipes seen as a public health risk?

A) They produce methane gas

B) They can protect opportunistic pathogens and lower disinfectant efficiency

C) They block water flow completely

D) They increase the salinity of the drinking water

30) The "mycoloop" is an ecological process where:

A) Fungi break down lignin in deep-sea sediments

B) Chytrid fungi infect phytoplankton, transferring energy to zooplankton

C) Viruses send carbon back into the microbial loop

D) Fungi form biofilms on the surfaces of viruses

31) Which bioremediation technology uses a combination of plants and microbes to remove nutrients and contaminants?

A) Bioreactors

B) Activated Sludge

C) Constructed Wetlands

D) Nitrification

32) What is a recognized limitation of using bioremediation for water treatment?

A) It tends to be more expensive than chemical methods

B) It cannot fully mineralize organics

C) Heavy metals cannot be destroyed but can only be transformed or removed

D) It is faster than chemical treatments

33) Which of the following is the right sentence regarding microbial indicators?

A) An ideal indicator should multiply rapidly once it enters the water environment.

B) Indicator organisms are usually more difficult to detect and quantify than the actual pathogens.

C) Drinking water should contain zero detectable *Escherichia coli* per 100 mL sample according to WHO guidelines.

D) Indicators like *E. coli* are only present when the water is completely free of pathogens.

34) Identify the correct statement about biological wastewater treatment:

A) The activated sludge process is a physical treatment that uses filters to remove all bacteria.

B) Biofilm reactors involve microorganisms growing attached to surfaces like rocks or plastic media.

C) Anaerobic digestion requires high levels of dissolved oxygen to produce methane gas.

D) Constructed wetlands use only chemical additives to remove nutrients from wastewater.

35) Which sentence accurately describes the role of viruses in aquatic ecosystems?

A) Viruses are the largest living organisms in the ocean and consume primary producers.

B) The "viral shunt" redirects carbon and nutrients away from the microbial loop and directly to large fish.

C) Bacteriophages are the most abundant biological entities in oceans and help regulate bacterial populations.

D) Viruses are easily eliminated from wastewater using standard primary sedimentation.

36) Which of these is the right sentence regarding microbiological methods?

A) The Membrane Filtration method uses a membrane with a 1.0~mm pore size to capture viruses.

B) Metagenomics is a classical method that requires culturing individual species on agar plates.

C) The Multiple Tube Fermentation (MPN) technique estimates coliform numbers based on gas production and acid formation.

D) Flow cytometry is a slow, manual method used primarily for counting large parasitic worms.

37) Which statement regarding bioremediation is correct?

A) Bioremediation is generally more expensive and less environmentally friendly than chemical treatment.

B) One limitation of bioremediation is that heavy metals cannot be destroyed; they can only be transformed or removed.

C) Microorganisms used in bioremediation can only function in temperatures above 50 circ

D) Bioremediation is the fastest possible method for removing all types of non-biodegradable plastics.

38) Identify the INCORRECT sentence regarding indicator organisms:

A) *An ideal indicator should be easy to detect and quantify.*

B) Indicators should survive longer in water environments than the actual pathogens.

C) An ideal microbial indicator should multiply excessively once it enters the water environment to make detection easier.

D) Drinking water must contain zero detectable *Escherichia coli* per 100 mL sample.

39) Which of the following statements is FALSE?

A) Viruses are the most abundant biological entities in aquatic systems.

B) The "viral shunt" redirects organic matter away from higher trophic levels (like fish) and back into the dissolved organic matter pool.

C) Viruses are generally larger than protozoa and can be easily removed by primary sedimentation.

D) Cold water temperatures can help viruses survive longer in the environment.

40) Identify the wrong sentence about laboratory techniques:

A) The Membrane Filtration method typically uses a 0.45 mm pore size to retain bacteria.

B) The Multiple Tube Fermentation (MPN) technique provides an exact count of every individual bacterial cell in a sample.

C) Metagenomics allows for the study of microbial communities without the need for culturing them.

D) Flow Cytometry is a rapid method that uses laser light to count and characterize cells.

41) Which statement regarding water treatment is INCORRECT?

A) Biofilm reactors involve microorganisms growing attached to surfaces like rocks or plastic.

B) Bioremediation is generally more expensive and produces more toxic byproducts than chemical treatments.

C) In the activated sludge process, suspended microbial biomass is used to degrade organic waste.

D) Constructed wetlands use a combination of plants and microorganisms to remove contaminants.

42) Match the microbial habitat to its correct description. Which pair is correct?

A) Pelagic Zone: The region between surface water and groundwater.

B) Benthic Zone: The open water column where organisms swim or float.

C) Hyporheic Zone: The bottom sediments of a lake or ocean.

D) Biofilm: Microbial communities attached to submerged surfaces.

43) Match the wastewater treatment stage to its primary function. Which is correct?

A) Primary Treatment: Biological degradation of organic matter using bacteria.

B) Secondary Treatment: Physical removal of large solids through screening and settling.

C) Tertiary Treatment: Advanced removal of nutrients (N & P) and disinfection (UV/Chlorine).

D) Anaerobic Digestion: A process that requires high oxygen levels to produce CO2.

44) What is the correct order of the stages in Anaerobic Digestion?

A) Methanogenesis → Acidogenesis → Hydrolysis → Acetogenesis

B) Hydrolysis → Acidogenesis → Acetogenesis → Methanogenesis

C) Acetogenesis → Hydrolysis → Methanogenesis → Acidogenesis

D) Acidogenesis → Acetogenesis → Hydrolysis → Methanogenesis

45) Which sequence correctly describes the "Viral Shunt"?

A) Virus infects fish → Fish dies → Bacteria eat fish.

B) Algae produce DOM → Virus eat DOM → Zooplankton eat Virus.

C) Virus infects bacteria → Bacteria lyse (burst) → DOM is released → DOM is reused by other bacteria.

D) Bacteria fix nitrogen → Virus eats nitrogen → Nitrogen is lost to the atmosphere.

46) Identify the FALSE statement regarding aquatic zones:

A) The pelagic zone refers to the open water column of an ocean or lake.

B) The benthic zone consists of the sediments at the very bottom of the water body.

C) The hyporheic zone is the region where surface water and groundwater mix.

D) Biofilms are only found in saltwater environments and cannot form on freshwater pipes.

47) Which of the following is the WRONG sentence regarding energy flow?

A) The "Microbial Loop" describes how bacteria recycle dissolved organic matter (DOM) back into the food web.

B) The "Viral Shunt" helps transfer energy directly from bacteria to large predatory fish.

C) The "Mycoloop" involves chytrid fungi making nutrients from large algae available to zooplankton.

D) Phytoplankton like Prochlorococcus are primary producers that use sunlight to create organic matter.

48) Identify the FALSE statement about microbial detection methods:

A) Flow Cytometry is a rapid method that uses lasers to count cells in a fluid stream.

B) PCR (Polymerase Chain Reaction) is used to amplify specific DNA sequences to detect pathogens.

C) Metagenomics requires every single microbe in a sample to be grown on an agar plate before it can be identified.

D) ATP Bioluminescence can be used to estimate the total amount of living biomass in a water sample.

49) Which of the following statements is INCORRECT?

A) Bioremediation is the use of microorganisms to remove or neutralize pollutants from a contaminated site.

B) Constructed wetlands utilize a combination of plants and microbes to treat wastewater.

C) Eutrophication is a beneficial process that increases oxygen levels in lakes by encouraging unlimited algal growth.

D) Heavy metals cannot be destroyed by microbes; they can only be transformed into different forms or removed from the water.

50) In Biogas production, which gas typically makes up the largest percentage (50–70%) of the final product?

A) Carbon Dioxide (CO2)

B) Hydrogen Sulfide (H2S)

C) Methane (CH4)

D) Nitrogen (N2)

With best wishes for success

Faculty of Science Botany& Microbiology Department		كلية العلوم قسم النبات والميكروبيولوجى
Ecology of Xerophyte and Halophyte Plants 432 N **Time: Two hours** **Total degree: 50 marks**		**Second semester exam - the academic year 2025/2026** **Fourth Level** **Exam date: Sunday, 7/6/2026**

Q1- Please choose the right answer. (10 marks)

1- .....are native to saline soils where they can grow satisfactorily, compete with other species in the same habitat and complete their life cycle.

a- Non-halophytes b- Halophytes c- glycophytes

2- ..... can usually be achieved by accumulation of salts in specific cells of the plant or by secretion of excess salts from the plant.

a- Salt tolerance b- Salt accumulative c- Salt evasion

3- ..... is attained only in those plants where protoplasm can endure high salt content without apparent damage of functions normally.

a- Salt tolerance b- Salt accumulative c- Salt evasion

4- ..... plants can resist salts by desalinization of their tissues and secrete excess salts through salt glands.

a- Succulent halophytes b- Nonsucculent halophytes c- Accumulative halophytes

5- .....halophytes plants with no special mechanism for salt removal, and salt concentration in their tissues increases until the plant's death.

a- Succulent b- Nonsucculent c- Accumulative

6- ..... halophytes are plants exhibiting optimal growth in saline environments, despite their appearance in non-saline habitats.

a- Obligatory b- Preferential c- Accidental

7- ..... are plants eliminating salts after salts have been absorbed (salt secreting halophytes).

a- Crinohalophytes b- Glycohalophyes c- Euhalophytes

8- .....plants that restrict salt accumulation or accumulate salts and localize them in specific tissues.

a- Crinohalophytes b- Glycohalophyes c- Euhalophytes

9- Iversen (1936) classified halophytes according to the salt content of the habitat into..... species: in habitats containing 0.01 – 0.1% NaCl.

a- Oligohaline b- Mesohaline c- Polyhaline

10- .....classified halophytes according to the mechanism of resistance or on the bases of systems of salt regulation.

a- Tsopa (1939) b- Stocher (1923) c- Adriani (1956

Q2- Please combines the two columns. (10 marks)

	Drought-Deciduous xerophytes	1	..... Annuals or short- lived vascular plants that germinate after fairly heavy rainfall to leach out the inhibitors and to support growth. These species rapidly complete their cycles of development in a few weeks.
	Tolerant Plants (arido-tolerant)	2	.....have underground organs full of water (rhizome, tuber, bulb and corn) that can survive periods of drought, being protected from excessive water loss by the soil.
	Ammophila	3	.....These plants have high stomatal conductance and high rates of photosynthesis and transpiration when water is available but lose (shed) their leaves and enter dormancy under conditions of low water potential.
	Trichophyllus xerophytes	4	.....Plants that cannot escape periods of drought can adapt to these conditions by avoidance and/or tolerance.
	arido-passive or Drought evader xerophytes	5	..... Drought tolerance refers to the species specific and adaptable capacity of protoplasm to endure severe loss of water.
	malacophyllous	6	..... species in the sands and .....species in the mountains, both of which bear large attractively-coloured flowers. Needless to say, these two species are insect pollinated
	Tribulus, Capparis	7	In some xerophytic grasses the epidermis of the upper surface of the leaves have *specialized motor cells* (*hinge cells*) responsible for minimizing the leaf area as in .....
	Latex Tubes.	8	The presence of storage tissues and mucilaginous substances are characteristic to many fleshy xerophytes.
	Geophytes	9	Xerophytes that possess abundant hair on their leaves and stems are commonly called .....
	Drought-Resistant Xerophytes	10	..... Found in many xerophytic stems and leaves the laticiferous canals are present (e.g. *Calotropis, Euphorbia,* some members of Asteraceae).

Q3- Write on: (30 marks)

1- Root Adaptation?

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2- The difference between Avoidant Plants (arido-active) and Tolerant Plants (arido-tolerant)?

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3- Shoot Adaptation? (Write 3)

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4- Difference between Vesiculated hairs or bladders and Salt glands of Plubaginaceae?

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5- Different Photosynthetic Pathways (C4 Syndrome CAM Plants C_3 plants)?

6- Difference between Abscisic Acid and Proline Accumulation?

7- Various ways the plants cope with salt stress or salinity?

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8- Classification of halophytes?

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9- Specific Adaptations of Halophyte Flowers?

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10- Difference between Succulent Perennials, Woody Perennials and Ephemerals?

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With my best wishes

Prof. Dr. Hanaa Kamal Galal

Faculty of Science Botany & Microbiology Department		كلية العلوم قسم النبات والميكروبيولوجي
Food Microbiology (498 B) **Time: Two hours** **Total degree: 50 marks** **No. of pages: 3 N0. of questions: 4**		**Second semester exam - the academic year 2025/2026** **Fourth Level** **Exam date: Sunday, 24/05/2026**

Answer all the following questions:

The first question: Write briefly about **three only** of the following: **(15 marks)**

1. **Control of food spoilage by modified atmosphere**
2. ***Clostridium botulinum* and its role in food spoilage**
3. **The principles of Hazard Analysis Critical Control Points**
4. **The effect of hydrogen ion concentration on microbial growth in food**

The second question: Compare between **two only** of the following: **(4 marks)**

1. **Nitrite and H_2O_2 as antimicrobial agents**
2. **Neurotoxin and enterotoxins**
3. **CAP and MAP.**

The third question: Choose the correct answer from the following: **(6 marks)**

1. **Freezing temperatures _____.**
   a. retard the action of bacteria and mold
   b. prevent microorganisms from growing
   c. destroy enzymes
   d. All are correct

2. **A type of food preservation technique that involves sealing food in sterilized, airtight containers:**
   a. Drying
   b. Canning
   c. Irradiating
   d. Heating

3. **In the fermentation process, microorganisms produce_____ which inhibit the growth of harmful microorganisms.**
   a. water and acid
   b. acid and alcohol
   c. alcohol and alkali
   d. water and alkali

4. **Which of the following bacteria does not need oxygen to survive and grow?**

a. *Salmonella* spp.
b. *Bacillus cereus*
c. *Clostridum botulinum*
d. *Staphylococcus aureus*

5. **The two parts of HACCP include:**

a. hazard analysis and critical control points
b. health analysis and critical control points
c. hazard analysis and critical conformation production
d. health analysis and critical conformation production

6. **What is food safety?**

a. The handling, preparation, and storage of foods in ways which prevent foodborne illness
b. Being safe around food
c. Hiding from the food so it doesn't kill you
d. Being careful around food

The fourth question - Answer with drawing as possible Only Five of the following: **(5 Marks each)**

1. Classify the Normal Microbiological Quality of Foods.

2-Illustrate the different categories of Immobilized Enzymes.

3- Discuss Water Activity and its influence in microbial growth in food.

4. Write on the Important Microbes in Food.

5. Account Food-borne Intoxications and the General Characteristics of Food Poisoning.

6- Enumerate the important Factors Affecting Microbial Food Spoilage (Sequence of events and Significance of Microbes).

7- What are the Factors to be considered in selecting a microbial or its metabolite (chemical) indicator for a product?

8- Identify Only Five of the following items:

Commensal - Coliforms - Probioties - Sanitation - Kimchi - Fastidious - Bacteriocin

Good luck

Prof. Dr. Amal Danial

Prof. Dr. Khalid A. Hussein

a. *Salmonella* spp.
b. *Bacillus cereus*
c. *Clostridum botulinum*
d. *Staphylococcus aureus*

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Good luck

Prof. Dr. Amal Danial

Prof. Dr. Khalid A. Hussein

	Assiut University- Faculty of Science First Semester- Final Exam 2025-2026 Botany and Microbiology Department	Program: Microbiology Level: (4) Date: 20/5/2026 Time: 2 h	
Course Title: Symbiosis Microbiology			Code: 496B
Instructors: Professor Dr. Nivien Allam &Dr. Shymaa Ryhan			
Important:	No. of pages 2	No. of questions 8	Total Mark:50 degree

Part I: Fungal Symbiosis:

Q1: True (√)-False (X) Questions: (5 marks)

1. Mycorrhizal networks allow plants to communicate and warn each other of attack by herbivores or pathogens. ( )
2. The level of association between plants and mycorrhizal fungi is independent on soil fertility. ( )
3. About 80% of ectomycorrhizal fungi are hypogeous. ( )
4. The Hartig net of ectendomycorrhizas develops inside cortical cells. ( )
5. Mycorrhizal hyphae colonizes fine rock surfaces to search for trapped minerals and provide them to the plant with high efficiency. ( )

Q2. Differentiate between: (6 marks)

A. Arum-type and Paris-type of Arbuscules.
B. Monotropoid and Orchid mycorrhizas.
C. Sexual and vegetative reproduction of lichen.

Q3. Discuss the function of the following: (*Answer 3 only*) (6 marks)

A. Mantle.
B. Mycorrhizae against biotic stress.
C. Ericoid mycorrhizae.
D. Intraradical hyphae of AMF.

Q4: Write short notes on: (*Answer 4 only*) (8 marks)

A. Mycorrhizal enhancement of tolerance to abiotic stress.
B. Vesicles and auxiliary vesicles of AM fungi.
C. Reproduction and life cycle of AM fungi.
D. Economic importance of lichen.
E. Arbutoid mycorrhizae.

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Part II: Bacterial Symbiosis (25 mark)

Q1. Answer Only two questions. Use well labeled diagrams where appropriate. (8 marks)

1. Illustrate the mechanism of infection by *Agrobacterium tumefaciens.*
2. Explain the symbiotic relationship between *Riftia pachyptila* and its bacteria.
3. Describe the structure and function of the nitrogenase enzyme and the energy requirements for the reduction of atmospheric nitrogen.

Q2. Compare between (*Answer 2 only*): (8 marks)

1. *Agrobacterium* and *Rhizobium*
2. Flavonoids and nod factor
3. Primary and Secondary symbionts

Q3. Write short notes on of the following (*Answer 2 only*): (4 marks)

1. *Frankia* 2. *Gunnera* 3. luminescent bacteria

Q4. Choose the correct answer to the following questions: (5 marks)

1. **Light production is constant regardless of bacterial population density.**
   A) True B) False
2. ***Wolbachia* is essential for survival of some insects.**
   A) True B) False
3. **The primary function of *Buchnera* in aphids is:**
   A) Defense against predators B) Digestion of cellulose
   C) Production of essential amino acids D) Nitrogen fixation
4. **The rumen is primarily responsible for:**
   A) Protein digestion by enzymes B) Microbial fermentation
   C) Mechanical grinding only D) Water absorption
5. **Which of the following is an actinorhizal plant?**
   A) Rice B) Maize
   C) Pea D) Casuarina

End of exam

Best Wishes

Professor Dr. Nivien Allam ***Dr. Shymaa Ryhan***

	Assiut University- Faculty of Science Second Semester- Final Exam 2025-2026 Department of Botany and Microbiology	Program: Microbiology Level: (4) Date: 17/5/2026 Time: 2 h	
Course Title: Microbial Ecology		Code: B494	
Instructors: Prof. Dr. Fatthy Mohamed Sayed Morsy ; Dr. Somaya Mahmoud Mohammed Nassar			
No. of pages: 13 Part I: 5 pages Part II: 8 pages	Part I and II: Answer in a bubble sheet	Total No. of Points: 50 Part I: 25 points (1 to 25) Part II 25 points (26 to 50)	Total Marks: 50 Part I: 25 Part II: 25

[Part I]: Choose the Correct Answer for the following questions. (25 points)
(Answer in a bubble sheet. Each question worth one mark)

1- Microbial survival in the air is affected by many environmental factors such as .....
a - temperature and relative humidity
b - oxygen content and specific ions
c - UV radiation and various pollutants
d - All the above answers are correct

2- Some pathogens are adapted for survival and transmission in the intramural environment. One good example of such a microbe is .....
a - *Streptococcus thermophilus*
b - *Legionella pneumophilia*
c - *Lactobacillus rhamnosus*
d - *Bifidobacterium lactis*

3- Aerosolization of indigenous soil pathogens such as ..... is a critical phenomenon in ....., as it acts as a primary mechanism for the transport of such pathogens from the ground into the atmosphere
a- *Lactobacillus acidophilus* - extramural aeromicrobiology
b- *Bacillus subtilis* - intramural aeromicrobiology
c- *Bacillus anthracis* - extramural aeromicrobiology
d- *Bifidobacterium lactis* - intramural aeromicrobiology

4- Which statement of the following is incorrect?
a- Bacteria and fungi are the major decomposers in the ecosystems which perform a valuable service as Earth's cleanup crew.
b- Microorganisms are key drivers of the Earth's biogeochemical cycles.
c- None of the microorganisms are primary producers in the ecosystems.
d- All the above answers are correct.

5- In terms of numbers, ... represent most of the diversity of life on Earth and are mostly found in every environment.
a- plants
b- microorganisms
c- animals
d- insects

6- **Energy enters an ecosystem usually as sunlight and flows through the system, driving metabolic processes before exiting as .....**

a- Carbon dioxide

b- UV radiation

c- heat

d- All the above answers are correct

7- **The study of life is structured around a hierarchy of biological organization where the basic structural and functional unit of life is the ..... which is considered the lowest level capable of carrying out all life processes such as most .....**

a- biosphere – animals

b- cell – microorganisms

c- ecosystem - plants

d- community – plants and animals

8- **Which of the following bacterial genera cannot fix atmospheric nitrogen?**

a- *Rhizobium*

b- *Azotobacter*

c- *Azomonas*

d- *Escherichia*

9- **What are the three processes involved in the aeromicrobiological pathway?**

a- Infection, immunity, recovery

b- Growth, reproduction, decay

c- Launching, transport, deposition

d- Photosynthesis, respiration, decomposition

10- **The outbreak of foot-and-mouth disease in the United Kingdom in 2001 caused a crisis where millions of cows and sheep were killed and incinerated in an eventually successful attempt to halt such airborne epizootic ..... disease infecting cloven-hoofed livestock.**

a- viral

b- fungal

c- bacterial

d- parasitic

11- **Ammonification is a critical nitrogen cycle process where microbes break down organic nitrogen from dead plants, animals, and wastes into ammonia or ammonium. Primarily carried out by diverse saprophytic bacteria such as .....**

a- *Clostridium*

b- *Arthrobacter*

c- Both answers (a) and (b) are correct

b- *Anabaena*

12- The ..... called ..... plays a critical role in the bioleaching and solubilization of the chemical nutrients for plants in soil, particularly phosphorus from insoluble rock phosphates where it produces sulphuric acid through sulpher oxidation and causes dissolution of the rock phosphates.

a- fungus - *Penicillium chrysogenum*
b- bacterium - *Thiobacillus thiooxidans*
c- alga - *Chlorella vulgaris*
d- archaeon - *Methanosarcina acetivorans*

13- One of the mechanisms of deposition for airborne bioaerosols is .....

a- Evaporation
b- Gravitational settling
c- Photolysis
d- Dialysis

14- Given below are two statements:

Statement I: Late blight can destroy potato crops in a fortnight.
Statement II: Fungi and bacteria can proliferate rapidly within days in moist environments within buildings, and become established as colonies on solid surfaces, subsequently releasing toxins and/or allergens into the air.
In light of the above statements, choose the correct answer from the options given below:

a - Both Statement I and Statement II are true
b - Both Statement I and Statement II are false
c - Statement I is true and Statement II is false
d - Statement I is false and Statement II is true

15- ..... found in the outer membrane of Gram-negative bacteria. are also referred to as ..... and are a highly antigenic biological agents that upon bacterial cell death and lyses and if associated with airborne particles such as dust, causes often acute respiratory symptoms.

a - Lipopolysaccharides – endotoxins
b -Teichoic acids – antigens
c - Murein – building blocks
d - Botulinum toxin – exotoxins

16- The spread of the airborne phytopathogen *Puccinia graminis* spores, the fungus causing wheat rust, is an example of the ..... transport of pathogens in the aeromicrobiological pathway

a- submicroscale
b- microscale
c- macroscale
d-None of the above

17- Given below are two statements:

Statement I: Bacteria have no role in the carbon cycle.

Statement II: Microbial toxins can be airborne.

In light of the above statements, choose the correct answer from the options given below:

a - Both Statement I and Statement II are true
b - Both Statement I and Statement II are false
c - Statement I is true and Statement II is false
d - Statement I is false and Statement II is true

18- Transport of bioaerosols can be defined in terms of time and distance where the ..... involves short periods of time, under 10 minutes, as well as relatively short distances, under 100 m. This type of transport is common within buildings or other confined spaces

a. macroscale transport
b. submicroscale transport
c. mesoscale transport
d. None of the above

19- The principal users of atmospheric carbon dioxide are photosynthetic autotrophs, such as ..... which convert carbon dioxide (inorganic carbon) to organic carbon through photosynthesis.

a- plants
b- algae
c- cyanobacteria
d- All the above answers are correct

20- Nitrifying bacteria are defined as microorganisms that participate in the oxidative arm of the nitrogen cycle, involving ammonium-oxidizers such as ..... oxidizing ammonium to nitrite and nitrite oxidizers such as ..... oxidizing nitrite to nitrate.

a- *Streptomyces - Streptococcus*
b- *Nitrosomonas - Nitrobacter*
c - *Lactobacillus – Lactococcus*
d - *Enterococcus – Enterobacter*

21- Botulinum toxin is a potent neurotoxin produced by the bacterium ..... *botulinum.* While commonly associated with foodborne illness, it is also a significant concern regarding inhalation exposure due to its high toxicity.

a- *Bacillus*
b- *Streptococcus*
c- *Clostridium*
d- *Mycobacterium*

22- Soil and dust particles act as a "raft" for ..... such as bacteria, fungi, viruses and microbial toxins by providing a solid surface for attachment, allowing them to remain suspended and transported in the atmosphere.

a- planktons
b- bioaerosols
c - probiotics
d - protozoa

23- **Methanogens such as *Methanosarcina* are crucial microorganisms in anaerobic environments that produce methane and .....**

a- carbon dioxide
b- oxygen
c- nitrogen
d- All the above answers are correct

24- **..... includes the community (biotic) plus abiotic (non-living) factors like sunlight, water, and soil.**

a- An ecosystem
b- A microbiome
b- A population
c- Biosphere

25- **Given below are two statements:**

Statement I: The spread of the airborne fungus *Phytophthora infestans* that causes late blight of potato throughout Europe led to the 1845 Irish potato famine. This pathogen destroyed the potato crop that was the main food crop for a large portion of the Irish population, leading to an estimated 750,000 to 1,000,000 deaths from starvation and related diseases.

Statement II: A population is a group of the same species living in an area.

In light of the above statements, choose the correct answer from the options given below:

a - Both Statement I and Statement II are true
b - Both Statement I and Statement II are false
c - Statement I is true and Statement II is false
d - Statement I is false and Statement II is true