
* Please answer following questions (English or Korean is fine but the keywords should be written in English)

- 1 Endospore's heat resistance probably is due to several factors. What are those factors? (4 points)

- 2 What are the toxic effects of O₂? How do aerobes and other oxygen-tolerant microbes protect themselves from these effects? (6 points)

- 3 What is the unit of D-value, z-value and F-value, respectively? (2 points)

- 4 What are the four most frequently employed physical agents for controlling microbial growth? Give one typical example (e.g. a process or device) using each physical agent (4 points)
 - 1)
 - 2)
 - 3)
 - 4)

- 5 Calculate the mean growth rate and generation time of a culture that increases in the exponential phase from 5×10^2 to 1×10^8 in 12 hours (2 points)

- 6 Describe the four phases of the growth curve in a closed system (4 points)

- 7 What advantage does a microbe gain by using active transport rather than facilitated diffusion? (3 points)

- 8 Why does peptidoglycan contain the unusual D isomers of alanine and glutamic acid rather than the L isomers observed in proteins? (3 points)

- 9 List three known prokaryotic cytoskeleton proteins and their functions (3 points)

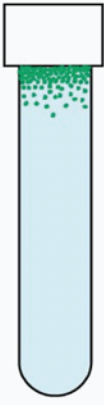
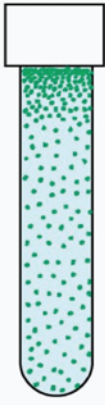
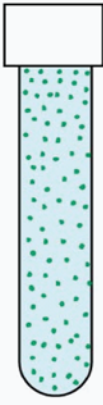
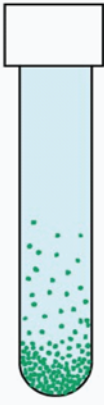
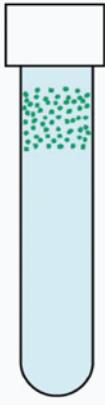
- 10 Compare and contrast the cell walls of gram(+) and gram(-) bacteria (6 points)

* Define or describe following terms (2 points each)

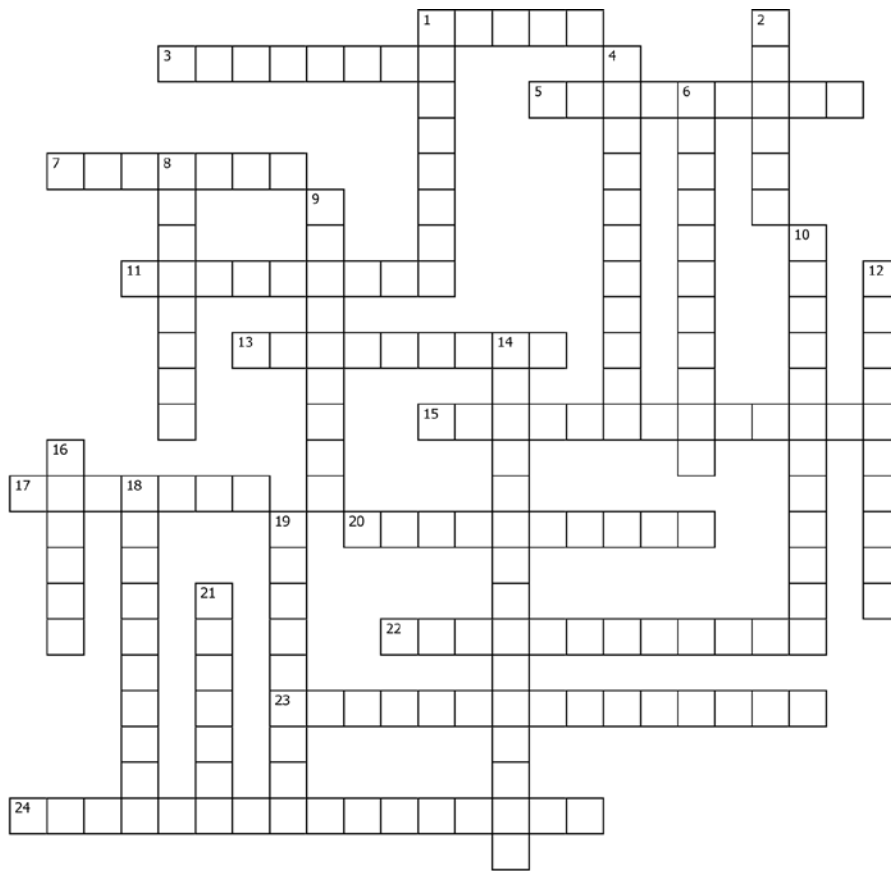
- 11 amphipathic
- 12 sterilization, disinfection and sanitization
- 13 complex, enriched and selective media
- 14 poly-hydroxybutyrate (PHB)
- 15 VBNC
- 16 water activity
- 17 chemotaxis
- 18 CFU
- 19 teichoic acid
- 20 LPS
- 21 spheroplast, protoplast

* Fill the blank in the following figure, which is describing oxygen and bacterial growth

- 22 1) identify the types of microorganisms depending on oxygen in following experiment
- 2) indicate the presence or absence of the enzymes (SOD and catalase) for each type are shown (use symbol '+' for presence and '-' for absence)

Example				
				
Obligate aerobe	()	()	()	()
Enzyme content	() SOD	() SOD	() SOD	() SOD
(+) SOD	() Catalase	() Catalase	() Catalase	() Catalase
(+) Catalase				

* Fill the blank in the CrossWord Puzzle (each 2 points)



ACROSS

- 1 Beta barrel proteins that cross a cellular membrane and act as a pore through which molecules can diffuse
- 3 They are very complex structures made of both protein and ribonucleic acid; Synthesizing proteins by translating mRNA
- 5 Proteins embedded in the cell membrane that regulate the flow of water; Transmembrane protein
- 7 Linked transport of two substances in the same direction
A way of transport
- 11 The endocytic vesicle formed by phagocytosis
- 13 Pentacyclic compounds similar to sterols, whose primary function is to improve plasma membrane fluidity in bacteria
- 15 That bacteria have a single flagellum on each of two opposite ends
- 17 Ribulose-5-bisophosphate carboxylase; critical enzyme for CO₂ fixation
- 20 The layer consists of a network of polysaccharides extending from the surface of the cell, this term can encompass both capsules & slime layers because they usually are composed of polysaccharides
- 22 Used by some bacteria to orient in the Earth's magnetic field; a kind of inclusion bodies
- 23 That is coiled more tightly, appears darker in the electron microscope, and is not genetically active most of the time; a genetic material
- 24 Prokaryotes that have growth optima between 80 celsius and about 113 degree celsius

DOWN

- 1 A relatively rigid later of proteinaceous elements just beneath the plasma membrane on many protozoa and algae
- 2 A polymer consisting of sugars and amino acids that forms a mesh-like layer outside the plasma membrane of bacteria, forming the cell wall
- 4 The continuous culture system which has a photocell that measures the absorbance or turbidity of the culture in the growth vessel
- 6 Refers to bacteria that are variable in shape and lack a single, characteristic form
- 8 Any organism which can cause disease in a person, animal, or plant
- 9 Microorganism with growth optima around 20 to 45 degree celsius
- 10 A small molecule that complexes with ferric iron and supplies it to a cell by aiding in its transport across the plasma membrane
- 12 Chemical agents applied to tissue to prevent infection by killing or inhibiting pathogens
- 14 A substance presents at high concentrations in the bacterial endospore, which is thought to contribute to the endospore's heat resistance; binding with Calcium ion
- 16 The loss of a plasmid which can occur spontaneously or be induced by treatments that inhibit plasmid replication
- 18 The phase of the cell cycle in which the cell spends the majority of its time and performs the majority of its purposes including preparation for cell division.
- 19 Organisms that prefer or require high pressures for growth and reproduction
- 21 A substance that helps fix dye on or in a cell