LESSON 2: MICROBIOLOGY

1. Reading the paragraphs

The term "virus" is derived from the Latin word for poison or slime. It was originally applied to the noxious stench emanating from swamps that was thought to cause a variety of diseases in the centuries before microbes were discovered and specifically linked to illness. But it was not until almost the end of the nineteenth century that a true virus was **proven** to be the cause of a disease.

The **nature** of viruses made them impossible to detect for many years even after bacteria had been discovered and studied. Not only are viruses too small to be seen with a light microscope but they also cannot be detected through their biological activity except as it occurs in conjunction with other organisms. In fact, viruses show no traces of biological activity by themselves. Unlike bacteria, they are not living agents in the strictest sense. Viruses are very simple pieces of organic material composed only of nucleic acid either DNA or RNA enclosed in a coat of protein made up of simple structural units (some viruses also contain carbohydrates and lipids.) They are parasites requiring human, animal, or plant cells to live. The virus replicates by attaching to a cell and injecting its nucleic acid. Once inside the cell, the DNA or RNA that contains the virus' genetic information takes over the cell's biological machinery and the cell begins to manufacture viral proteins rather than its own.

1. Which of the following is the best title for the passage?
   (A) New Developments in Viral Research
   (B) Exploring the Causes of Disease
   (C) DNA of virus
   (D) Understanding Viruses

2. Before microbes were discovered it was believed that some diseases were caused by
   (A) germ - carrying insects
   (B) Certain strains of bacteria
   (C) Foul odors released from swamps
   (D) Slimy creatures living near swamps

3. The word "proven" is closest meaning to which of the following.
   (A) Shown
   (B) Feared
   (C) Imagined
   (D) Considered

4. The word "nature" is closest in meaning to which of the following?
   (A) Self - sufficiency
   (B) Shapes
   (C) Characteristics
   (D) Speed
5. The author implies that bacteria were investigated earlier than viruses because
   (A) Bacteria are easier to detect
   (B) Bacteria are harder to eradicate
   (C) Viruses are extremely poisonous
   (D) Viruses are found only in hot climates
6. All of the following may be components of a virus EXCEPT
   (A) RNA
   (B) Plant cells
   (C) Carbohydrates
   (D) A coat of protein

Bacteria are extremely small living things. While we measure our own sizes in inches or centimeters, bacterial size is measured in microns. One micron is a thousandth of a millimeter (a pinhead is about a millimeter across). Rod shaped bacteria are usually from two to four microns long, while rounded ones are generally one micron in diameter. Thus if you enlarged a rounded bacterium a thousand times, it would be just about the size of a pinhead. An adult human magnified by the same amount would be over a mile (1.6 kilometers) tall. Even with an ordinary microscope, you must look closely to see bacteria. Using a magnification of 100 times, one finds that bacteria are barely visible as tiny rods or dots. One cannot make out anything of their structure. Using special stains, one can see that some bacteria have wavy - looking "hairs" called flagella attached to them . Others have only one flagellum. The flagella rotate, pushing the bacteria though the water. Many bacteria lack flagella and cannot move about by their own power while others can glide along over surfaces by some little understood mechanism.

From the bacterial point of view, the world is a very different place from what it is to humans. To a bacterium, water is as thick as molasses is to us. Bacteria are so small that they are influenced by the movements of the chemical molecules around them. Bacteria under the microscope, even those with no flagella, often bounce about in the water. This is because they collide with the water molecules and are pushed this way and that. Molecules move so rapidly that within a tenth of a second the molecules around a bacterium have all been replaced by new ones even bacteria without flagella are thus constantly exposed to a changing environment.

7. Which of the following is the main topic of the passage?
   (A) The characteristics of bacteria
   (B) How bacteria reproduce
   (C) The various functions of bacteria
   (D) How bacteria contribute to disease
8. Bacteria are measured in
   (A) Inches
   (B) Centimeters
   (C) Microns
   (D) Millimeters
9. Which of the following is the smallest?
   (A) A pinhead
   (B) A rounded bacterium
   (C) A microscope
   (D) A rod - shaped bacterium
10. According to the passage, someone who examines bacteria using only a microscope that magnifies 100 times would see
   (A) Tiny dots
   (B) Small "hairs"
   (C) Large rods
   (D) Detailed structures
11. The relationship between a bacterium and its flagella is most nearly analogous to which of the following?
   (A) A rider jumping on a horse's back
   (B) A ball being hit by a bat
   (C) A boat powered by a motor
   (D) A door closed by a gust of wind
12. In line 14, the author compares water to molasses, in order to introduce which of the following topics?
   (A) The bacterial content of different liquids
   (B) What happens when bacteria are added to molasses
   (C) The molecular structures of different chemicals
   (D) How difficult it is for bacteria to move through water

Fungi, of which there are over 100,000 species, including yeasts and other single-celled organisms as well as the common molds and mushrooms, were formerly classified as members of the plant kingdom. However, in reality, they are very different from plants and today they are placed in a separate group altogether. The **principal** reason for this is that none of them possesses chlorophyll, and since they cannot synthesize their own carbohydrates, they obtain their supplies either from the breakdown of dead organic matter or from other living organisms. Furthermore the walls of fungal cells are not made of cellulose, as those of plants are, but of another complex sugar-like polymer called chitin, the material from which the hard outer skeletons of shrimps, spiders, and insects are made. The difference between the chemical composition of the cell walls of fungi and those of plants is of enormous importance because it enables the tips of the growing hyphae, the threadlike cells of the fungus, to

secrete enzymes that break down the walls of plant cells without having any effect on those of the fungus itself. It is these cellulose- destroying enzymes that enable fungi to attack anything made from wood, wood pulp, cotton, flax, or other plant material. The destructive power of fungi is impressive. They are a major cause of structural damage to building timbers, a cause of disease in animals and humans, and one of the greatest causes of agricultural losses. Entire crops can be wiped out by fungal attacks both before and after harvesting. Some fungi can grow at + 50°C, while others can grow at -5C, so even food in cold storage may not be completely safe from them. On the other hand, fungi bring about the decomposition of dead organic matter, thus enriching the soil and returning carbon dioxide to the atmosphere. They also enter into a number of mutually beneficial relationships with plants and other organisms. In addition, fungi are the source of many of the most potent antibiotics used in clinical medicine, including penicillin.

13. What does paragraph 1 mainly discuss?
    (A) Differences between simply and complex fungi
    (B) Functions of chlorophyll in plants
    (C) Functions of sugar in the walls of fungal cells
    (D) Differences between fungi and plants

14. Which of the following is mentioned as a major change in how scientists approach the study of fungi?
    (A) Fungi are no longer classified as plants
    (B) Some single-cell organisms are no longer classified as fungi.
    (C) New methods of species identification have been introduced
    (D) Theories about the chemical composition of fungi have been revised.

15. The word "principal" is closest in meaning to
    (A) True
    (B) Main
    (C) Logical
    (D) Obvious

16. According to the passage, how do fungi obtain carbohydrates?
    (A) The absorb carbohydrates from their own cell walls.
    (B) They synthesize chlorophyll to produce carbohydrates.
    (C) They produce carbohydrates by breaking down chitin.
    (D) They acquire carbohydrates from other organic matter, both living and dead.

17. The passage mentions shrimps, spiders, and insects in line 9 because their skeletons
    (A) Can be destroyed by fungi
    (B) Have unusual chemical compositions
    (C) Contain a material found in the walls of fungal cells
    (D) Secrete the same enzymes as the walls of fungal cells do

18. Which of the following terms is defined in the passage?
    (A) "Chlorophyll"
    (B) "Polymer"
    (C) "Hyphae"
    (D) "Enzymes"

19. The word "those" in line 12 refers to
    (A) Tips
    (B) Hyphae
    (C) Enzymes
    (D) Walls

20. Fungi have all of the following characteristics EXCEPT
    (A) They grow hyphae.
    (B) They secrete enzymes.
    (C) They synthesize cellulose.
    (D) They destroy crops.

21. The word "Entire" in line 19 is closest in meaning to
    (A) certain
    (B) Whole
    (C) Mature
    (D) Diseased

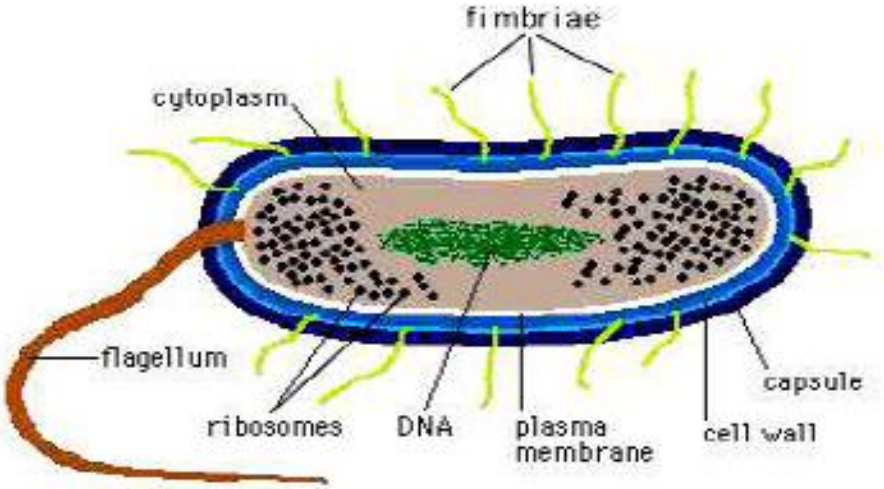
22. The passage describes the negative effects of fungi on all the following EXCEPT
    (A) Buildings
    (B) Animals
    (C) Food
    (D) Soil

23. The phrase "bring about" in line 19 is closest in meaning to
    (A) Cause
    (B) Join
    (C) Take
    (D) Include

24. The passage mentions "penicillin" in line 22 as an example of
    (A) A medicine derived from plants
    (B) A beneficial use of fungi
    (C) A product of the relationship between plants and fungi
    (D) A type of fungi that grows at extreme temperatures.

2. Learning points

The picture below is a general idea about bacterial structure



3. Key structures

PASSIVE VOICE

ACTIVE	**PASSIVE**
Infections **cause** most fevers (Object)	Most fevers (Subject) **are caused** by infections
People **called** it a unit of life (Object)	It (Subject) **was called** a unit of life
People also know that veterinary medicine is concerned with the diagnosis, treatment and prevention of diseases in animals	It is also known that veterinary medicine is concerned with the diagnosis, treatment and prevention of diseases in animals Veterinary medicine is also known to be concerned with the diagnosis, treatment and prevention of diseases in animals

The passive statements

Subject	*be (not)*	*Past participle*	*(by+object)*	
Most fevers	are (not)	caused	by infection	
It	was (not)	called		a unit of life

Exercise: Change these sentences into passive and join into one sentence

1. Periodic outbreaks of disease in the community can often naturally boost memory of immunity

.....

2. The protozoa, fungi, plants, and animals represent the eukaryotes

.....

3. Spores are very resistant to heat, harmful agents such as drying, radiation, acids, and chemical disinfectants and even harsh chemicals cannot destroyed these spores easily

.....

4. The nuclear envelope surrounds the nucleus in eukaryotic cell

.....

5. People also say that disease means a change in the normal condition of an animal caused by a living organism

.....

6. They call diseases caused by living organisms infectious

.....

7. Small flying insects can transmit viruses from one animal to others

.....

4. Special difficulties

Look at the sentence:

"An adult human magnified by the same amount would be over a mile (1.6 kilometers) tall"

How to say "1.6" in English?

or "One micron is a thousandth of a millimeter (a pinhead is about a millimeter across)"
*What does "*a thousandth of a millimeter" mean ?

In this part, we will learn how to say this number and a variety of kind of number which are usually seen in scientific papers.

Cardinal and ordinal number:

1, 2, 3	One, two, three
Over 20: 35; 67	thirty-five; sixty-seven
Over 100	
329	three hundred and twenty nine
Over 1000	
1100	one thousand one hundred (eleven hundred)
2500	two thousand two hundred (twenty-five hundred)
33,423	thirty three thousand four hundred and twenty three
2,768,941	two million seven hundred and sixty eight thousand nine hundred and forty one

1^{st}; 2^{nd}; 3^{rd}; 4^{th}; 5^{th}; 9^{th}; 12^{th}; 21^{st}
First; second; third; fourth; fifth; ninth; twelfth; twenty-first

Fractions, decimals, and percentage

1/2	a/one half
1/3	a/one third
1/4	a/one quarter
3/4	three quarters
9/10	nine tenths
19/56	nineteen over fifty-six
5 ½	five and a half
0.67	nought/zero/oh point six seven
3.142	three point one four two
65%	sixty-five percent

Other mathematical expression

(+)	plus
(–)	minus
(x)	times / multiplied by
(÷)	divided by
(=)	is / equals
3^2	three squared
5^3	five cubed
6^8	six to the power of eight
$\sqrt{\ }$	square root of