*** Fill the blank (2 points each)**

1 The concept that living organisms arise from nonliving material is called (**spontaneous theory**)

2 The concept that human and animal diseases are caused by microorganisms is called (**germ theory**)

3 A 45X objective and a 10X ocular produce a total magnification of (**450**)

4 A microscope that exposes specimens to ultraviolet, violet, or blue light and forms an image with the light emitted at a different wavelength is called a (**fluorescence**) microscope.

5 An instrument that magnifies slight differences in the refractive index of cell structures is called a (n) (**phase contrast**) microscope.

6 If the objective lenses of a microscope can be changed without losing focus on the specimen, they are said to be (**parfocal**).

7 When the cell wall is removed from a Gram-negative bacterium without removing the outer membrane, the resulting form is called a(n) (**spheroplast**).

8 A (**capsule**) is a polysaccharide layer that lies outside the cell wall and is not easily removed.

9 A (**slime**) layer consists of diffuse unorganized polysaccharide material that lies outside the cell wall and is easily removed.

10 A(n) (**S**) layer is a layer of protein or glycoprotein that exhibits a pattern resembling floor tiles.

11 Proteinacious projections from the surface of a bacterium that are used to mediate conjugation are called (**pili**), whereas projections that mediate attachment to surfaces such as host cells are called (**fimbriae**).

12 Bacteria have a region of the cytoplasm known as the (**nucleoid**), which is not bounded by a membrane but contains the chromosome.

13 Bacteria that do not have a fixed shape are said to be (**pleomorphic**).

14 Intracellular granules of organic or inorganic material that are stockpiled by bacteria for future use are called (**inclusion bodies**).

15 The Golgi apparatus is responsible for (**secretion**).

16 The (**pellicle**) is a complex structure or set of structures lying beneath the plasma membrane of many protozoa and some algae, which gives some cells their characteristic shape

17 The inner membrane system of chloroplasts consists of flattened sacs called (**thylakoids**) that form stacks called (**grana**).

18 (**Growth factors**) are required organic compounds because they are essential cell components or precursors of such components that cannot be synthesized by the organism.

19 Transport of two different substances can be linked. If the transport is in the same direction it is called (**symport**); if the transport is in opposite directions it is called (**antiport**).

20 Many bacteria facilitate the uptake of iron by secreting low molecular weight molecules, called (**siderophore**), to form complexes with the iron that can then be readily transported into the cell.

*** Fill the blank with (chemotroph, carbonotroph, organotroph, heterotroph, methylotroph, phototroph, lithotroph, monotroph, autotroph)**

21 Organisms that use reduced, preformed organic molecules as carbon sources are (**heterotroph**)

22 Organisms that obtain electrons from the oxidation of inorganic compounds are called (**lithotroph**)

23 Organisms that can use carbon dioxide as their sole or principal source of carbon are (**autotroph**)

24 Organisms that obtain electrons from the oxidation of organic compounds are called (**organotroph**)

25 Organisms that obtain energy from light are called (**phototroph**)

26 Organisms that obtain energy from the oxidation of either organic or inorganic compounds are called (**chemotroph**)

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27 You have a microscope which uses an oil immersion objective (numerical apeture of 1.25) and blue-green light (wavelength of 530 nm). 1) What is the maximum theoretical resolving power of this microscope? 2) If our eyes can just detect a speck 0.2 mm in diameter, what is the useful limit of maganification? (5 points)

1) d=1/2 (530/1.25) = 212 nm or 0.2 um, 2) 0.2 mm/ 0.2 um = 1,000 (X)

28 What is episome? (2 points)

(a plasmid able to integrate into chromosome and replicated with chromosome)

29 What is the function of Lipopolysaccharides (LPSs)? What are three parts consisting of LPS? (5 points)

(giving negative charge on surface, stabilizing outer membrane, eliciting immune response, endotoxin), (O-side chain, core polysaccharide, LipidA)

30 What makes an endospore so resistant to harsh conditions? (5 points)

(calcium with dipicolinic acid, acid-soluble DNA binding proteins, dehydrated core, spore coat, DNA repair enzymes)

31 Eukaryotic cell structure shows a great complexity comparing to that of prokaryotic cell. The complexity is due chiefly to the use of internal membranes. What are the benefits (purposes) of complex membrane structures in eukaryotes? (5 points)

**(1. the placement of different biochemical and physiological functions in separate compartments,
2. independent control and proper coordination among compartments,
3. greater respiratory and photosynthetic activity,
overall, helping adequate regulation, metabolic activity, and transport (due to bigger size of eukaryotic cell)**

32 What features of chloroplasts and mitochondria support the endosymbiotic theory of their evolution? (5 points)

(1. resemble bacteria in size and apperance, 2. contain circular DNA, 3. reproduce semiautonomously, 3.have own ribosomes, 4. have more similar rRNA sequnce to Bacteria, 5. symbiotic association in protozoa)

33 Compare Bacteria, Archaea, and Eukarya in terms of their plasma membrane structure (5

(Bacteria: Ester-linked phopholipids, hopanoids and some has sterols, Archaea: Glycerol diethers and diglycerol tetraethers, some has sterols, Eukarya: Ester-linked phopho lipid and sterols)

34 In many bacteria, facilitated diffusion does not seem to be the major uptake mechanism. Why? (5 points)

(nutrient concentrations often are lower outside the cell)

35 What are the functions of following vitamins?
1. thiamine (viatime B1), 2. riboflavin (vitamin B2), 3. pyridoxine (vitamin B6), 4. cyanocobalamine (vitamin B12) (8 points)

(1. aldehyde group transfer, 2. percursor of FAD and FMN (electron or hydrogen atom carrier), 3. amino acid metabolism, 4. molecular rearrangement, one-carbon metabolism

*Bonus

John Tyndall, Theodore Schwann, James Watson, Louis Pasteur, Carl Woese, Francis Crick, Edward Jenner, Elie Metchnikoff, Antony van Leeuwenhoek, Robert Hooke, John Needham, Robert Koch, Joseph Lister, Alexander Flemming, Shibasaburo Kitasato, Francis Collins

1 Who was the first to observe and accurately describe microorganisms? **Antony van Leeuwenhoek**

2 Who did provide the critical evidence needed to discredit the concept of spontaneous generation? **Louis Pasteur**

3 The ribosomal RNA studies that led to the division of procaryotic organisms into the Bacteria and the Archea were begun by whom? **Carl Woese**

4 Whose work on spontaneous generation first demonstrated the existence of a very heat-resistant form of bacteria that are called endospores? **John Tyndall**

5 Antiseptic surgery was pioneered by whom? **Joseph List**er

6 Who is credited with developing and documenting the first vaccination procedure against smallpox? **Edward Jenner**

7 Who of the following first discovered that some blood leukocytes could engulf disease-causing bacteria? **Elie Metchnikoff**

8 Who did make the first direct demonstration of the role of bacteria in causing disease from the study of anthrax? **Robert Koch**