UNIT E – MICROBIOLOGY

CHECK YOUR UNDERSTANDING – PAGE 28

Part A. Multiple Choice

1.	D	9.	B	17.	B	25.	C	33.	C
2.	A	10.	A	18.	C	26.	A	34.	A
3.	D	11.	C	19.	B	27.	C	35.	C
4.	C	12.	D	20.	B	28.	D	36.	B
5.	D	13.	D	21.	D	29.	B		
6.	A	14.	C	22.	D	30.	C		
7.	B	15.	A	23.	B	31.	A		
8.	A	16.	B	24.	A	32.	B		

Part B. Written Answers

1. a. There are five criteria at the beginning of the unit. Taking each one in turn:
   - viruses are structured differently than cells
   - viruses are not metabolically active
   - viruses are produced and cease to exist (but are these processes "birth" and "death"? A sheet of plywood is produced and ceases to exist when it is cut up!)
   - viruses have genetic material and are produced (but do they reproduce?)
   - viruses have no response mechanisms other than chemical interaction on specific cells prior to injecting their genetic material

   Overall, viruses are not generally considered to be living, though this is an on-going discussion.

   b. Viruses can be classified as pathogens because many are disease-causing and microscopic. It is convenient to consider them in this light. It must be remembered, however, that most biologists would agree that viruses are aggregations of chemicals and not living creatures. Pathogens are generally thought of as microorganisms (such as bacteria and protists).

2. a. active vs. passive immunity.
   Active immunity is the result of antibody activity where the antibodies are produced within one's system. Passive immunity is acquired through the injection of antibodies into one's system. Passive immunity is shorter-lived.

   b. interleukin vs. interferon.
   Both of these are proteins that are produced and released by certain types of white blood cells (leukocytes). Interleukins stimulate the activity of other leukocytes, where are interferon coats body cells preventing viral recognition of potential host cells.

   c. lytic cycle vs. lysogenic cycle.
   The lysogenic cycle of viral infection occurs when the viral nucleic acid combines with the host's genetic material. It remains intact in this condition for a period of time during which the host cell may undergo mitosis, replicating the viral genetic material along with its own. The segment of viral genetic material is called a prophage. At some time, the prophage is spurred into action and the cell begins to manufacture multiple copies of viral molecules, which self assemble. Eventually, the host cells burst open releasing the viruses. The lytic cycle does not include a prophage stage.

   d. prokaryotic vs. eukaryotic.
   Prokaryotic cells lack internal membranes...the only membrane they have is their cell membrane. This means they do not have any organelle that is membranous (incl. nucleus, chloroplast, mitochondria, etc.). Ribosomes are not membranous, giving them the ability to synthesize proteins. Eukaryotic cells have membranous organelles.

   e. conjugation vs. binary fission.
   Conjugation is considered to be sexual reproduction because it involves the transfer of genetic material between cells and results in genetic variations. Binary fission is asexual.

   f. heterotrophic vs. autotrophic.
   Heterotrophs obtain their nutrients from other organisms (either by eating or absorbing), where autotrophs can make their nutrients from the chemicals and energy available in the environment.

   g. aerobic vs. anaerobic.
   Aerobic describes organisms that require oxygen to survive. Anaerobic organisms require the absence of oxygen.

   h. antibiotic vs. antiseptic.
   Antibiotics are pharmaceuticals (drugs) that are taken internally to kill bacteria. Antiseptics are substances like alcohol, whose best applications are external. Antiseptics will also kill bacteria.

3. A viral disease has to "run its course". This means that there are no effective medicines that can be used to disassemble the viruses; they are not alive and therefore cannot be killed. Their destruction is wholly dependent on the body's immune system, where they are recognized as foreign and defensive mechanisms are developed to destroy them (hopefully before they have done too much damage of their own).

4. a. The three common shapes of bacteria are coccus (spherical), bacillus (rod-shaped) and spirillus (spiral-shaped)

   

   b. *Pneumococcus* is spherical; *E. coli* is rod-shaped; and *T. pallidum* is spiral-shaped.

5. Bacteria can be identified by color of colonies, nutrient source, oxygen requirement, etc.

6. Bacteria metabolize the sugars in the fruit (like grapes) being used to make the wine. These are anaerobic bacteria, and the products of their metabolism are carbon dioxide and ethyl alcohol.

7. A strain is a genetic variant. Different strains of pathogenic bacteria exist and are at the mercy of antibiotics. Using an antibiotic to eliminate one strain of bacteria allows the remaining strains to flourish due to decreased competition among the bacteria for food, space etc. This is potentially dangerous when the flourishing strain is also pathogenic but not sensitive to the antibiotic (or any antibiotic).

8. Bacteria can be found in:
   - stomach (*H. pylori*), where they are parasites living off soft tissues resulting in ulcers.
   - intestines (*E. coli*), where they are symbionts contributing to feces production.
   - soil (various kinds), where they are decomposers contributing to the return of nutrients to the soil.