Part I. Clinical Applications

1. Your friend tells you that he is taking the antibiotic streptomycin for an infection. He wants to know how this particular antibiotic can kill bacterial cells but not kill his own cells. What is your explanation?

   Streptomycin inhibits bacterial protein synthesis by interfering with ribosomal function of bacteria and has no effect on the ribosomes of humans. If the bacterial are unable to synthesize new protein (many of which would be essential enzymes), they will die.

2. Sarah, a trainee of the electron microscopist at the local hospital is reviewing some micrographs of muscle cells and macrophages (phagocytic cells). She notices that the muscle cells are loaded with mitochondria while the macrophages have abundant lysosomes. Why is this so?

   Mitochondria are the site of most ATP synthesis, and muscle cells use tremendous amounts of ATP during contraction. After ingesting bacteria or other debris, phagocytes must digest them, explaining the abundant lysosomes.

3. You overhear a group of teenagers betting each other as to who could drink the most water within a 30 minute time span. Being the excellent medical student that you are you interrupt them and explain the dangers of drinking seemingly harmless liquid (water) in such a short period of time. What is your explanation?

   Drinking water is hypotonic to the cells of you body. Taking in too much water in a short period of time will cause the blood and eventually the interstitial fluid to become hypotonic to the body cells. The extracellular water will then move by osmosis into the body cells and cause them to rupture. This could, and has in the past, kill a person.

4. One remedy for constipation is a saline laxative such as Epsom salts (MgSO4). Why do such salts have a laxative effect?

   Epsom salts increases the solute concentration in the lumen of the large intestine making the intestine hypertonic to surrounding tissues. The osmosis of water occurs from the surrounding tissues into the intestinal lumen. The fluid helps soften the stool and the watery environment prepares the intestine for eventual evacuation of the stool from the bowel.

5. In a hospital, a nurse gave a patient recovering from surgery a transfusion of 5% salt solution by mistake instead of a transfusion of physiological saline (0.9% salt). The patient quickly went into shock and soon after died. What caused the patient to enter into a state of shock and die?

   Because of the increase of solute concentration in the body fluid, it became hypertonic to the RBCs. The RBCs dehydrated and shrank – crenation. The crenated RBCs lost their oxygen-carrying capacity and the body tissues were deprived of the oxygen necessary of cellular metabolism to support life.
Part II
1. intracellular fluid
2. interstitial fluid (intercellular);
extracellular;
homeostasis
3. blood; lymph
4. extra-
D
5. D
6. D
7. B
8. more; fewer
9. A
10. out of; crenate

Part III
1. Glycoprotein
2. Integral protein
3. Cholesterol
4. Peripheral protein
5. Integral protein with pore
6. Simple diffusion
7. Filtration
8. Facilitated diffusion
9. Osmosis
10. low; high
11. ATP
12. Phagocytosis, Pinocytosis (bulk-phase),
Receptor mediated endocytosis
13. Phagocytic vesicle
14. Receptor mediated endocytosis

Part IV
1. Cell (plasma) membrane
2. Cytoplasm
3. Nuclear envelope (membrane)
4. Nucleolus
5. Nucleus
6. Lysosome
7. Centrosome
8. Centrioles
9. Microtubule network
10. Microvilli
11. Cilia
12. Secretory vesicles
13. Golgi apparatus (body)
14. Smooth endoplasmic reticulum (SER)
A. Mitochondria
B. Ribosome (attached to RER)
C. Free ribosome
D. Rough endoplasmic reticulum (RER)
15. F
16. T
17. F
18. F
19. T
20. F
21. mitosis, somatic cell division
22. meiosis, reproductive division
23. cytokinesis
24. anaphase
25. prophase
26. metaphase
27. telophase
28. leukemia
29. sarcoma
30. lymphoma
31. osteogenic sarcoma
32. melanoma
33. carcinoma
34. neoplasm; malignant; benign
35. malignant; metastasis
36. meiosis; mitosis
37. cytokinesis; mitosis

Part V
1. RER
2. SER
3. SER
4. golgi complex
5. lysosome
6. mitochondria
7. microfilaments
8. microtubules
9. centrioles
10. flagella
11. cilia
12. SER
13. mitochondria
14. cilia
15. golgi
16. lysosomes
17. simple diffusion
18. facilitated diffusion
19. osmosis
20. pinocytosis (bulk-phase endocytosis)
21. phagocytosis
22. exocytosis
23. D
24. B
25. more; fewer
26. A
27. out of; crenate
28. lso
29. Isotonic; Hypotonic to Isotonic (depending on severity). An isotonic solution is 0.9% NaCl or 5% glucose. A hypotonic solution will be less.
30. C
31. A
### Part VI

1. Exocytosis, phagocytosis, pinocytosis, receptor-mediated endocytosis
2. simple diffusion, osmosis, facilitated diffusion
3. filtration
4. simple diffusion, osmosis, facilitated diffusion
5. active transport
6. simple diffusion
7. active transport
8. exocytosis, phagocytosis, pinocytosis, receptor-mediated endocytosis
9. phagocytosis
10. exocytosis
11. facilitated diffusion
12. prophase
13. anaphase
14. telophase
15. telophase
16. metaphase
17. prophase
18. prophase
19. S
20. prophase
21. prophase
22. telophase/cytokinesis
23. anaphase; metaphase
24. Go
25. C
26. B
27. B
28. A
29. C
30. A

### Part VII

1. A (Moves into the sac)
2. B (Moves out of the sac)
3. C (Does not move)
4. A (Moves into the sac)
5. A; crenated
6. B; The same solute concentration inside and outside the cell
7. C; Movement of water into the cells due to osmosis
8. B
9. C
10. D
11. B
12. C
13. A
14. D
15. C
16. A

### Part VIII

1. Proteins
2. helix
3. phosphate
4. sugar
5. bases
6. amino acids
7. complementary
8. cytosine
9. thymine
10. ribosome
11. replication
12. nucleotides
13. template or model
14. new
15. old
16. genes
17. growth
18. repair