(1) Review & read Cells & Prokaryotic Cell Structure in Chapter 4. Review & read Membrane Transport on pages 195-200 (only) in Chapter 7. Study the questions below in study groups. Do multiple choice questions (Chapter 4: 1-12, 14-16, Chapter 7: 8-10), and the concept/writing to learn questions (Chapter 4: 1-17, Chapter 7: 6-8) at the end of the chapter.

1. Which of the Five Kingdoms is/are prokaryotes? Which of the Five Kingdoms are eukaryotes? In the newer Three Domain system, which domains are prokaryotes and which eukaryotes?

2. How does the size of prokaryotes compare with that of eukaryotes?

3. What are the three main components of the cell theory? How did Schwann, Scheiden & Virchow contribute to this theory?

4. Describe the main differences between a prokaryotic cell and a eukaryotic cell?

5. What is the difference between cell morphology and cell arrangement? Why are they important when first investigating an unknown microbe? What do the following terms mean: cocci, bacilli, spirilla, vibrio, star, square, diplo, strepto, staphylo, sarcinae?

6. What is the structure, location & purpose of a glycocalyx? What types of cells have one? Be able to distinguish between a slime layer and a capsule. Relate this to the formation of microbial biofilms (hospitals, dialysis tubing, dental decay, sewage treatment).

7. What is the function of a prokaryotic flagellum? Use terms like chemo-, photo-, magnetotaxis. How does its structure differ from that of a eukaryote? What are the three main components of a bacterial flagellum? What is the main structural protein? How can flagellar antigens be used to distinguish pathogenic serovars? What are the four main arrangements of flagella found in prokaryotic cells? What is the difference between a flagellum and an axial filament? What types of cells have axial filaments?

8. What is the structural difference between fimbriae & pili? What are their functions? What types of cells have them?

9. What are the main benefits of having a cell wall? Explain what can happen to a bacterium if its cell wall is damaged (protoplasts, spheroplasts). How could this happen? Give genetic & chemical examples e.g. l-mutants, penicillin, lysozyme, detergents.

10. Why is the Gram stain the most important bacterial stain performed by a medical microbiologist?

11. Describe the chemical structure of a Gram positive cell wall. Use terms like: thick layers of peptidoglycans, N-acetyl glucosamines (NAGs), N-acetyl muramic acids (NAMs), polypeptides, teichoic acids. How does the wall structure relate to the Gram stain? What are the clinical implications of Gram positive organisms? Relate to antibiotic sensitivity & disinfection.

12. Describe the chemical structure of a Gram negative cell wall. Use terms like: outer membrane, lipid A, O polysaccharide, porins, large periplasmic space, single, peptidoglycan layer. How does the wall structure relate to the Gram stain? What are the clinical implications of Gram negative organisms? Relate to antibiotic sensitivity & disinfection.

13. Give some examples of bacteria that have unusual cell walls or no cell walls describing their structure & clinical significance (Mycobacteria, Mycoplasma, Archaea).

14. Describe the fluid mosaic model. Use terms like: phospholipid bilayer, intergral, peripheral & transmembrane proteins, sterols, horizontal side movements of embedded molecules. What molecule do prokaryotes generally lack in their plasma membranes compared with eukaryotes?

15. What are the functions of a plasma membrane? What molecules will naturally diffuse through any cell membrane from the cytoplasm to the environment & vice versa? What molecules...
cannot get through? What does selectively permeable mean? How does a plasma membrane control the entrance & exit of molecules?

16. Distinguish between the different forms of passive and active transport. Use terms like: concentration gradient, no energy, ATP, hydrophobic, hydrophilic, non-polar, polar, specific transmembrane proteins, diffusion, osmosis, osmotic pressure, hypertonic, isotonic, hypotonic, facilitated diffusion, carriers, ion pumps, group translocation, bulk transport, endocytosis, & exocytosis.

17. What are the main components of the cytoplasm besides water?

18. Describe a prokaryotic chromosome and be able to say how it differs from a eukaryotic chromosome. What is a bacterial plasmid? List some functions of plasmids & explain why they are useful to pathogens but scary to epidemiologists & clinicians?

19. What is the function of a ribosome? Compare and contrast the structure of ribosomes (small & large subunits) found in prokaryotes and eukaryotes. Why are these structural differences useful to pharmacists? Given the differences you have described, why do some antibiotics still cause side effects to eukaryotic organisms i.e. to us?

20. Name at least six substances stored by bacteria in inclusions and/or granules. What are their functions?

21. What genera of bacteria are endospore-formers? What triggers sporulation and germination? What is a vegetative cell? Why is endospore formation not considered to be a form of reproduction? What environmental factors are endospores resistant to? Why? Use terms like: thick wall, calcium ions (Ca++), dipicolinic acid, dormant/slow metabolism. Why do infection control nurses dread nosocomial infections caused by endospore-formers? How can they be controlled?

22. Be able to list some microbial cell types with unusual characteristics (Rickettsias, Chlamydias, Mycoplasmas, Photosynthetic bacteria, Archaea). Are any of these organisms of medical significance?

Remember, you will not be turning these questions in to me, but these are critical for your success!