Micro Exam 2: Objectives → Likely Short-Answer Questions (Questions Only)

BIOL 4640 · Exam Wed 10/28 · ★ = asked on a past Exam 2 · ★★ = asked both years · QUESTIONS ONLY: write your answer, then check the answer version

How to answer

- **Term → mechanism chain → result.** Example: penicillin **looks like D-Ala-D-Ala** → binds **PBPs** → blocks **transpeptidation** → holes in growing cells → water in → **lysis**.
- Short answers are **3–4 pts each, 7–8 per exam (~25%)**, and on past exams came almost only from **B (external structures)** and **C (cell envelope)**.

A. Size and Shapes of Bacteria (multiple choice only)

Q1. Compare the size of eukaryotic microbes, bacteria and viruses, and name the basic shapes and arrangements.

B. External Structures

Q2. ★ Describe the number and arrangement of flagella observed in bacteria and how flagella move to cause motility. (4 pts, 2025)

Q3. Describe the parts of a bacterial flagellum and the role of each.

Q4. ★ Describe the basic order in which the sections of a flagellum are assembled. (3 pts, 2024)

Q5. ★ List two forms of motility other than the typical flagella and describe how each occurs. (4 pts, 2025)

Q6. What is chemotaxis, and how does a bacterium move toward an attractant?

Q7. ★ List three tests a scientist could do to show or predict that a new organism is motile. (3 pts, 2025)

Q8. How do pili differ from flagella in structure and assembly?

Q9. Describe the roles of common pili, sex pili and Type IV pili.

C. Cell Envelope

Q10. ★★ Describe the layers and components found in the envelope of a Gram-NEGATIVE bacterium. (3 pts, 2024)

Q11. ★★ Describe the layers and components found in the envelope of a Gram-POSITIVE bacterium. (4 pts, 2025)

Q12. Describe the envelope of Mycobacteria, Archaea or Mollicutes and how it differs from typical bacteria.

Q13. ★ Describe two techniques to support that a purple-staining isolate has a Gram-positive envelope. (3 pts, 2024)

Q14. ★ Describe three ways the nature of the envelope affects the properties of a bacterium. (3 pts, 2025)

Q15. ★ What types of molecules are in the glycocalyx? Describe two roles. (3 pts, 2024)

Q16. What is the S-layer made of and where is it found?

Q17. Describe the parts of LPS and how the outer membrane acts as a barrier.

Q18. ★ Describe the basic structure of peptidoglycan in Gram-negative bacteria. (3 pts, 2025)

Q19. How does peptidoglycan differ in Gram-negative vs Gram-positive bacteria?

Q20. Describe the order of events in peptidoglycan synthesis, including the role of bactoprenol.

Q21. How does pseudopeptidoglycan differ from peptidoglycan?

Q22. What is the periplasm and what are its functions?

Q23. ★ Describe two ways the components of membranes can differ. (3 pts, 2024)

Q24. Compare passive and active transport and describe the three kinds of active transport.

Q25. How does the transport of ions differ from the transport of sugars?

Q26. ★ Describe how penicillin acts against bacteria: its target and its effect. (4 pts, 2025)

Q27. ★★ Give two reasons why penicillin may not work (stream water 2024 / doctor 2025). (3 pts)

Q28. Describe the mechanism of action of cephalosporin, bacitracin, vancomycin, D-cycloserine or lysozyme.

Q29. Describe two ways bacteria resist antibiotics (for example penicillin).

D. Internal Structures

Q30. How do bacterial ribosomes differ from eukaryotic ones, and why does that matter?

Q31. Describe the cytoskeleton proteins FtsZ, MreB and crescentin and their roles.

Q32. How is DNA packed in the nucleoid without histones?

Q33. ★ List two compartments found inside bacteria; describe their structure and role. (4 pts, 2024)

Q34. Describe two inclusions and their roles.

Q35. What is an endospore, what triggers its formation, and why is it resistant?

E. Cell Division

Q36. Describe the steps of bacterial cell division.

Q37. How does cell division differ in E. coli, Bacillus and Staphylococcus?

Q38. Describe the roles of FtsZ and the Min proteins.

Q39. Describe asymmetrical division and cell polarity (Caulobacter).

F. Viruses

Q40. Which components are found in all virus particles and which only in some? Compare naked and enveloped viruses.

Q41. What features are used to classify viruses?

Q42. Describe the steps of the virus multiplication cycle.

Q43. Describe synthesis for a (−) sense RNA virus or a retrovirus.

Q44. Describe the possible outcomes of a viral infection of an animal cell.

G. Atypical Bacteria and Viruses

Q45. Describe how Rickettsia, Chlamydia or giant viruses are like bacteria and how they are like viruses.

Q46. How could you predict the structures and properties of a newly discovered bacterium?

Top Priority (write from memory before the exam)

- ★★ Q27 why penicillin may not work · ★★ Q10/Q11 Gram − and Gram + layers · ★ Q26 how penicillin works
- ★ Q2 flagella arrangement · ★ Q4 assembly order · ★ Q5 other motility · ★ Q7 motility tests
- ★ Q15 glycocalyx · ★ Q18 peptidoglycan structure · ★ Q14 envelope effects · ★ Q13 confirm Gram + · ★ Q23 membrane differences · ★ Q33 compartments