MCB 150 Spring 2026
Prof. Saxton

MCB150 Midterm 1 study guide

1. Big Picture Concepts

Be able to:

- Compare innate vs adaptive immunity
- Define clonal selection
- Explain how innate immunity activates adaptive immunity
- Describe the four core tasks of the immune system

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2. Complement System

Be able to:

- Distinguish classical, lectin, and alternative pathways
- Describe how C3 convertase and C5 convertase are formed
- Explain the three outcomes of complement activation
- Understand host regulatory mechanisms

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3. Pattern Recognition Receptors (PRRs)

Be able to:

- Define PAMPs
- Identify major PRR families (TLRs, NLRs, RLRs, cGAS)
- Understand how different PRRs signal and what transcriptional programs they induce
- Explain inflammasome activation and consequences
- Predict immune outcomes of PRR activation

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4. Inflammation & Cytokines

Be able to:

- Explain chemotaxis and endothelial activation
- Identify which cytokines/chemokines signal via:
  - JAK/STAT
  - NF-κB
  - GPCRs
- Describe type I interferon effects
- Describe systemic effects of IL-6, TNF, and IL-1

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5. Antibody Structure & Function

Be able to:

- Know antibody structure (heavy/light, Fab/Fc, CDRs)
- Define epitope
- Distinguish linear vs conformational epitopes
- Explain isotype conceptually
- Compare monoclonal vs polyclonal antibodies
- Analyze/interpret flow cytometry plots

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6. V(D)J Recombination
Be able to:

- Describe organization of Ig heavy and light chain loci
- Explain role of key components that mediate V(D)J recombination
- Explain junctional diversity
- Determine if a rearrangement is productive

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7. MHC & Restriction
Be able to:

- Distinguish MHC class I vs II
- Explain MHC restriction
- Define polymorphism and haplotype
- Explain co-dominant expression
- Predict transplant rejection outcomes
- Explain alloreactivity
- Understand how MHC polymorphism affects peptide binding

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8. Antigen Processing
Be able to:

- Outline MHC class I processing pathway
- Outline MHC class II processing pathway
- Predict effects of defects in pathway components

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9. Antigen Receptor Signaling
Be able to:

- Explain how TCR signaling is initiated (ITAMs, Lck, ZAP-70)
- Explain how BCR signaling is initiated (Igα/β, Syk)
- Trace pathway to:
    - NFAT
    - NF-κB
    - AP-1