

Qualifier Study Guide

This guide is not exhaustive, but if you follow the guide, you should pass the qualifier. The qualifier will have 65 to 70 multiple-choice questions. The number of questions in each discipline below will be roughly proportional to the amount of material in the course:

- Biochemistry: 30%
- Cell Biology/Histology: 35%
- Physiology: 20%
- Pharmacology: 10%
- Pathology: 5%

There will also be a couple of questions on the Health Maintenance and History of Medicine sessions.

One question (worth 5 points) will ask you to submit a multiple-choice question that addresses content covered in this course. The question should have these elements:

- Stem - provide some clinical or research context
- At least four options
- Rationale for correct answer

Key Dates

The qualifier will open Wednesday, September 18 and your answers must be uploaded by 11:45 PM on Sunday, September 22.

Biochemistry

- You should know the basic mechanisms of transcription, RNA processing and translation and their regulation, but pay closer attention to those steps where a disease or therapeutic was mentioned.

- You should be familiar with the different metabolic pathways to the extent that you know the major inputs and outputs.
- In the metabolic pathways pay closer attention to steps and enzymes that are associated with a disease or that are subject to regulation.
- Be familiar with how the body responds (utilizes a different pathway) when one metabolic pathway is inhibited or the input to that pathway is in limited supply
- Differentiate between competitive and non-competitive inhibitors of enzymes

Cell Biology/Histology

- Identify and classify in histological images epithelia, connective tissue and muscle
- Identify the different components of blood vessels in histological images and electron micrographs
- Describe the general functions of different types of epithelia
- Diagram how epithelia generate vectorial transport of solutes and water
- Understand the general process of renewal of epithelia by stem cells
- List the functions of the basement membrane
- In histological images, identify signs of inflammation (immune response) and fibrosis
- Know the different components of different types of connective tissue
- Know the proteins that mediate interactions between cells and between cells and the extracellular matrix
- Describe the basic mechanisms of muscle contraction and its activation in different muscle types
- Diagram the homeostatic mechanisms that keep blood glucose concentrations around 5 mM.
- List the oncogenic components of mitogen signaling pathways
- Understand how tumor suppressors slow the cell cycle

- Diagram how G-protein coupled receptors increase protein kinase A or protein kinase C activity
- Describe how chaperones facilitate protein stability and function

Physiology

- Diagram how the different ion channels set resting membrane potential
- Describe the changes in ion channels that generate action potentials in neurons and skeletal muscle
- Describe how cells can take up a specific solute against a concentration gradient
- Calculate the volume of fluid in the different body compartments of a patient given the patient's weight
- Given blood tests results, identify abnormal concentrations of sodium, potassium, chloride, bicarbonate and anion gap.
- Calculate how administration of a certain volume and concentration of saline changes the fluid distribution in the body

Pharmacology

- Differentiate between competitive and non-competitive inhibitors
- Calculate the fraction of drug a that is absorbed by the body based on the pKa of the drug and the pH of the fluid compartments
- Calculate the rates of clearance, volume of distribution and bioavailability of a drug
- Diagram drug conjugation and detoxification pathways

Pathology

- Differentiate the processes of metaplasia, hyperplasia, dysplasia, apoptosis, and atrophy

- Identify conditions that lead to metaplasia, hyperplasia, dysplasia, apoptosis, and atrophy