Study Outline

Part 1: Introduction to the Brain

Chapter 1: Brain Basics .................................................................6

Anatomy

Lobes

Forebrain, Midbrain, Hindbrain

Neuron

Compartments of Neuron

Nucleus, Dendrites, Axon, Synapse, Mitochondria, etc.

Electrical signaling, Action potentials, etc.

Synapses

Other Cell types

Glia, microglia (astrocytes, oligodendrocytes)

Neurotransmitters / Neuromodulators

Acetylcholine, DA, NE, Serotonin, Neuropeptides, Hormones

Intracellular Signalling

2nd messengers, etc.

Chapter 2: The Developing Brain ................................................... 13

Neuronal development

Neuronal migration, axon guidance

Synapse formation, and pruning

Critical periods

Plasticity

Part 2: Sensing, Thinking, and Behaving
Chapter 3: Senses and Perception ................................................................. 18

Vision

Pathway

Lens, photoreceptors, LGN, visual cortex/occipital lobe

Receptive fields

Other senses

Hearing, taste, smell, touch

What is transduction cell for each?

What is something unique about each?

Chapter 4: Learning, Memory, and Language .......................................................... 25

Learning & Memory

Limbic system, hippocampus, anatomy

H.M.

Types of memory

Working memory

Semantic memory

Episodic memory

Synaptic plasticity, LTP

Language

What brain regions are important?

Chapter 5: Movement .................................................................................................. 29

Reflex / involuntary movement

Neural pathway to spinal cord and back

Voluntary movement

Cortical processing areas
Cerebellum, motor coordination

Chapter 6: Sleep ................................................................. 32
  Stages of sleep
  Brain activity and REM
  Sleep disorders
  Important brain regions

Part 3: Across the Lifespan

Chapter 7: Stress ................................................................. 36
  Acute vs. chronic stress
  Stress mediator: glucocorticoids
  Impact of chronic stress on health

Chapter 8: Aging ................................................................. 39
  Effects on memory
  Normal changes vs. Disease
    Dementia

Part 4: Brain Research

Chapter 9: Kinds of Research .............................................. 42
  Common animal subjects in research
  Types of research techniques
    Electrophysiology
    Imaging (e.g. PET, MRI)
  Role of genes in research and disease
    What is a mutation?
    Landmark gene discoveries
      Huntington’s disease: HTT
Fragile X syndrome: FMR1

Part 5: Diseases and Disorders

Chapter 10: Childhood Disorders

Autism, ADHD, Down syndrome, Dyslexia

What are some key characteristics of each?

Chapter 11: Addiction

Main neurotransmitter system involved in addiction: Dopamine

What are the key brain structures of this system?

Alcohol

What neurotransmitter or neurotransmitter receptor does alcohol alter?

Common health problem associated with alcohol addiction

Marijuana

What neurotransmitter or receptor does marijuana alter?

Effect of marijuana on memory

What are other drugs of abuse?

Chapter 12: Degenerative Disorders

Alzheimer’s disease, ALS, Huntington’s disease, Parkinson’s disease

What are key features?

What is the main brain region or type of neurons affected?

Chapter 13: Psychiatric Disorders

Anxiety, Depression, Tourette Syndrome, Bipolar Disorder, Schizophrenia

Main features?

Chapter 14: Injury and Illness

Brain tumors

What is it?
Main form of treatment

Multiple sclerosis
- What type of disease?
- Effects on neuronal communication

Pain
- Acute vs. chronic
- What is an NSAID?
- Role of opioids

Epilepsy
- What is the defining characteristic?
- How common is it?

Stroke
- Role of blood vessels / cardiovascular system
- What causes it? What are some common symptoms?

Part 6: Treating Brain Disorders

Chapter 15: Potential Therapies ................................................................. 73
- Know some examples and what they do

Chapter 16: Neuroethics ................................................................. 76
- What is it?
- What is the role of neuroethics?
- What types of questions do neuroethics address?