- Describe the three major divisions of the vertebrate brain and what each does, in general terms. How does the relative size of each region vary in different organisms?
    - Forebrain: Smells, sleep, learning, complex processing
    - Midbrain: Connects and routes sensory input
    - Hindbrain: Involuntary activities like breathing, blood circulation
        - Birds and mammals have much larger forebrains
        - Free-swimming fish have really large cerebella for balance and orientation
- Are all regions of the brain required to sustain life?
    - No; the body can stay alive without the forebrain and the midbrain
- What are the two major divisions of the nervous system? What organs/nerves are part of each division?
    - Central nervous system: brain and spinal cord
    - Peripheral nervous system: all the body nerves (sensory, afferent, efferent, motor, enteric, etc)
- How are the efferent neurons of the peripheral nervous system subdivided?
    - Into the autonomic nervous system and the motor system
- How is the autonomic nervous system subdivided? Generally speaking, what does each subdivision do? How do they work together?
    - Parasympathetic
    - Sympathetic
    - Balance one another to create homeostasis (ex dilating and constricting pupil)
- What is a synapse?
    - Communication point between two neurons or one neuron and something else
- What are the two types of synapse? How are signals transmitted in each type? What are the pros and cons of each?
    - Chemical synapse:
        - Chemical messenger molecules are released to communicate between cells
        - Vesicles fuse with presynaptic membrane, diffuse through the synaptic cleft, and bind to receptors on the postsynaptic cell
            - Two main kinds of receptors:
                - Ionotropic = ligand-gated ion channels
                - Metabotropic receptors: could cause release of a second messenger, could be coupled to another channel
    - Electrical synapse:
        - Cells communicate through gap junction channels, hexameric connexin channels, allowing the electrical impulse to travel directly via ionic diffusion
            - Much faster, more reliable
            - Characterize escape reflexes
- A particular neurotransmitter can only be excitatory OR inhibitory- true or false?
- What is an inhibitory postsynaptic potential? An excitatory postsynaptic potential? Explain what they are physiologically and what their effect on the neuron is.

- Generally speaking, what does acetylcholine do?
    - What are the two types of receptor that it can bind to, and what are the effects of binding to each one?
    - What effect would a drug have if it was an agonist of each receptor? If it was an antagonist? Name an example of each kind of drug (four total)
    - What do acetylcholinesterase inhibitors do?
- How do we end a signal that's being transmitted by a neurotransmitter (two ways)?
- What effect, generally speaking, does GABA have?
    - What type of receptor does it bind?
    - What effect would a drug have if it was an agonist of each receptor? If it was an antagonist?
- What effect, generally speaking, does glycine have?
    - What type of receptor does it bind?

    - What effect would a drug have if it was an agonist of each receptor? If it was an antagonist?

- How does a neuron integrate all of the neurotransmitter input from its neighbors and decide whether it should fire an action potential?
    - It does this through spatial and/or temporal summation of postsynaptic potentials
- What effect, generally speaking, does glutamate have?

    - What type(s) of receptor does it bind?

    - What effect would a drug have if it was an agonist of each receptor? If it was an antagonist?

- How does glutamate signalling play a role in learning and memory? (Hint: what does the term “long-term potentiation” mean?)

- What is the unique way that glutamate is removed from the synapse?

- What effect, generally speaking, does dopamine have?

    - What type(s) of receptor does it bind?

    - What effect would a drug have if it was an agonist of each receptor? If it was an antagonist?

- What effect, generally speaking, does serotonin have?

    - What type(s) of receptor does it bind?

    - What effect would a drug have if it was an agonist of each receptor? If it was an antagonist?
    - If a drug is a “serotonin reuptake inhibitor” (SRI), what effect would you infer from that term in terms of neurotransmitter levels and in terms of whole-organism effect?

- What effect, generally speaking, does nitric oxide have?
    - What types of receiver does it interact with?
    - What effect would a drug have if it was an agonist of this receiver? If it was an antagonist?

- Acetylcholine - inhibitory
    - Binds to muscarinic cholinergic receptor, a metabotropic receptor
    - G protein activates a potassium channel
    - Potassium goes out and cell gets hyperpolarized
    - This makes the postsynaptic neuron less likely to fire an action potential
    - Therefore this is an inhiitory postsynaptic potential
- norepinephrine/epinephrine
    - Binds to beta1 receptor
    - Activates sodium and calcium channels
    - Depolarizes the cell
    - Makes it more likely to fire an action potential
    - Exitatory post synaptic potential
- Neurotransmitters are not in and of themselves exitatory or inhibitory- it all depends on what channel they are binding to
- Define agonist and antagonist
    - If i tell you what a compound does to a particular kind of receptor or a neurotransmitter-degrading enzyme, tell me what would happen to the body
        - Acetylcholine
        - Norepinephrine
        - Gaba
        - Glycine
- Terminating chemical transmission
    - Inactivating enzyme: ex: acetylcholine esterase
    - Transporters: reuptake the neurotransmitter back into the presynaptic neuron
- GABA and Glycine
    - Receptors are ligand gated fluoride channels
    - Extinguish any action potential in the neuron
    - Cause inhibitory neurotransmission
- How do we coordinate excitatory and inhibitory inputs?
    - Spatial summation
        - Need to reach potential threshold at the axon hillock, which is where the voltage gated channels are that will first propagate the action potential through the cell
- Glutamate
    - Unique way of removing glutamate
        - Glial cells have glutamate transporters and can suck it out of the synapse

I would make flashcards for:

- Agonist
- Antagonist
- Acetylcholine
- Norepinephrine
- GABA
- Glycine
- Glutamate