Unit Two Homework Assignment
C15 Autonomic Nervous System

ANS: Sympathetic VS Parasympathetic (5 minutes)
1. What is regulated by the ANS? (Effector tissues?)
2. Is the ANS under voluntary control?
3. What division of the ANS is activated by danger of physical activity? What increases in the body (stimulated)? What decreases in the body (inhibited)?
4. What division of the ANS is associated with rest and digestion? What increases in the body (stimulated)? What decreases in the body (inhibited)?
5. What is autonomic tone? Do both divisions of the ANS synapse on most organs? Significance?
6. What structure is only innervated by the sympathetic nervous system? How does it regulated blood flow (increase or decrease)?
7. How many neurons make the pathway from the CNS to the target tissue?
8. Where is the origin of the SNS motor pathway?
9. What term is used to summarize the fact that one SNS fiber may synapse with up to 20 postganglionic fibers?
10. Where is the origin of the PNS motor pathway?
11. Are the PNS postganglionic fibers long or short? Significance?

Neurotransmitters in the ANS Explained (17 minutes)
1. How are neurons named? Based on what?
2. What is the neurotransmitter released by the preganglionic fibers in both the PNS and SNS? Receptor type?
3. What is the receptor on all postganglionic fibers? (ionotropic or metabotropic?)
4. What are the two receptor types able to bind acetylcholine?
5. Is it possible for SNS and PNS to have only acetylcholine neurontransmitter for both their pre and post ganglionic fibers? Receptor type at target tissue?
6. What is an adrenergic neuron? What type of neurotransmitter is released?
7. Why is the sympathetic nerve called the one exception in the SNS? Significance?
8. Is the sympathetic nerve pathway faster or slower than the normal PNS or SNS? Why?
9. If you are a skydiver, then what pathway are you trying to activate?

US Hisory of Addiction
1. What two conditions do opioids produce?
2. Where does opioids come from?
3. What happened about 200 years ago?
4. When did America experience its first opioid epidemic? Why?
5. What did Bayer Corporation introduce as a safer than morphine product? T/F?
6. Who first started to use heroin? Where?
7. When did US government do in 1914? Result?
8. When was the next opioid epidemic? Who effected? Why did they need to inject the heroin?
9. When happened in 1996? How does this epidemic compare to other drug epidemics?
10. What was the major contributor to the high rates of addiction and overdose deaths?
11. Who prescribed the opoids?
11. Are drug manufacturers guilty of immoral marketing programs to increase sales their sales of opioids?

Addiction and the Brain (10 min)

1. Why was the function of the Mesocorticolimbic Dopamine Reward Pathway developed?
2. What three structures contribute to the reward pathway?
3. How do you feel when rewarded?
4. What two things activate the reward system?
5. What neurotransmitter do all addictive drugs modulate?
6. What is the first stage of addiction? Two brain structures involved?
7. What two neurotransmitters are responsible for feeling of pleasure?
8. What are two other brain regions activated in start of addiction? Function of each?
9. What is the second stage of drug addiction?
10. What brain structures are associated with the second stage of drug addiction?
11. What happens to dopamine levels when the addict is not using the drug? Feeling caused?
12. What role is played by the extended amygdala in the second stage of addiction? Type of hormone produced?
13. When do you realize you are addicted to a drug (or behavior)?
14. What is the final stage of addiction?
15. What occurs in the final stage?
16. What role does glutamate play in the final stage of addiction?
17. What role does the hippocampus play in addiction?

Addiction: A Disease of Our Survival System - 12 min1.

1. What is addiction?
2. What is a cause of addiction?
3. What is addiction a disease of?
4. What is the one function of the brain?
5. What two principles is used by the brain to complete its function?
6. What neurotransmitter is used by the brain to reward pleasure and avoid pain?
7. What two basic stimuli associated with survival will cause the release of dopaimne and cause pleasure?
8. What two terms maybe used to describe dopamine's functions?
9. What is the function of the anterior cingulate cortex?
10. What is the function of the orbitalfrontal cortex?
11. How do the anterior cingulate cortex and orbitalfrontal cortex work together to safeguard your survival?

Addiction 101 (Dr. Waller)

1. What is the number one injury related cause of death in US?
2. Why do we need dopamine?
3. How much dopaimine do you need to motivate you to start your day?
4. What about a really bad day?
5. The best day?
6. Favorite food?
7. Sex? 92 nanograms per deciliter
8. What about methamphetamine?
9. Why does it become a survival issue for the brain?
10. What two limbic brain structues are directly responsible for the reward pleasure pathway?
11. What happens with chronic use of methamphetamine?
12. How low may dopamine be in withdrawal? Condition of patient?

How Opioids Cause Addiction (Dr. Waller)

1. Why do patients think opioids are awesome?
2. Where is the locations for opioids ability to block pain and what do the opioids bind to?
3. What is the opioid effect if the person in not in pain and what brain chemical will be secreted?
4. What occurs when a patient becomes more dependent on the opioid?
5. Why do opioids "suck"?
6. What is biggest risk of opioids?
7. Are more overdose deaths caused by prescription drugs or heroin?
8. After addiction what will craving cause a person to do?
9. When are opioids appropriate?
10. What type of treatment should a patient receive if they exhibit pain behaviors that look like they have an opioid use disorder? What do the patients really need?

Opiod Addiction: Mechanism of Action - Part One (12 min)

1. What is the worst sensation a person can experience?
2. What class of drugs block pain? Common types?
4. What is the main opiod receptor? Location?
5. After an opioid drug crosses the blood brain barrier, what will happen?
6. How do neurons communicate?
7. How do opioids block pain?
8. What type of receptor is the opiod receptor?
9. What are the two subclasses of the G protein?
10. What do mu G-alph opioid receptors on the synaptic knob do?
11. How do mu G-allpha receptors on the post synaptic membrane effect the signal?
12. What do mu G-alph proteins do? Effect on neuron?
13.. What are the three ways opioids stop pain signals?
14. What is the function of the ascending pain pathway? Number of neurons in pathway?
15. What is the function of the descending pain pathway?
16. What is function of opioid on these two pathways?
17. What type of information is transmitted to the brain by the tertiary ascending neurons?
18. What is the normal state of the descending pathway?

Opioid Addiction - Addiction and Overdose - Part Two (16 min)

1. Where does addiction start in the brain? Responsible for what? Activated by?
2. What sensation is felt when the reward pathway is activated? Causes what behavior?
3. What are the two most important structures in the reward pathway? Neurotransmitter released?
4. What type of interneurton inhibits the ventral tegmental area? Causing what? 5. What type of receptor is on the GABAergic interneuron? Ligand for this receptor?
6. What is "drug liking"? Drives what?
7. What may influence the rate of drug liking and make some people more vulnerable to addiction?
8. What are the three factors associated with opioid Use Disorder?
9. What is drug tolerance?
10. What is the risk associated with opioid tolerance? higher the intake the greater for overdose and death
11. What is currently the most studied theory of opioid tolerance? cyclic AMP pathway
12. What is cAMP effect on a neuron? more cAMP activates neuron // less cAMP inhibit neurons
13. What occurs after chronic use of opioids? Causes what? no longer decreases cAMP and results in tolerace
14. What role is homeostasis in causing tolerance? opioids reduce cAMP levels below normal so homeostasis tries to restore cAMP levels to normal levels but overshoots target causing higher levels of cAMP // taking opioid now brings cAMP levels only back to normal // to inhibit neuron then more and more opioid is required
15. How may changes in opioid receptor also contribute to tolerance? receptor phosphorylation, receptor internalization, receptor uncoupling
16. How is withdrawal symptoms related to cAMP? What happens to cAMP levels during withdrawal? cAMP levels now unusually higher than normal // certain neurons now overactive and cause withdrawal symptoms
17 What are the brain's three areas associated with withdrawal? ventral tegmental area, locus ceruleus, samll and large intestines
18. What is the pattern of neuron function seen during opioid use and withdrawal? use = opposite of normal function (inhibition) // withdrawal causes excess of normal functions (overactivation)
19. Where is the locus ceruleus located? Functions? brainstem // wakefulness, psycological stress plus activates the sympathetic nervous system when activated causes sweating, pupil dialation, increase heart-reperation rate
20. What occurs to cAMP when LC becomes tolerant to opioids? What then happens during withdrawal? higher than normal camp level // no opioids to bring back to normal level // over stimulation with jittersiness, aniety-panic-stress, excess sweating, extreme dialated pupils rapid heart-respiratory rate // all extreme versions of normal LC functions
21. What happens in the digestive system during opioid use? Why?
22. What happens in the digestive system during withdrawal? Why?
23. What happens in the ventral tegmental area after chronic opioid use or during withdrawal?
24. Do people chronically addicted to opioids take the opioids to get high (pleasure) or to feel normal?
25. How do addicts die during an overdose?
26. How may you reverse an opioid overdose? Mechanism?

Serotonin VS Dopamine (10 min)

1. What is the neurotransmitter dopamine telling you?
2. What is the neurotransmitter serotonin telling you?
3. What is the role of cortisol? What part of the brain is the target for cortisol? Function?
4. What does a broken prefrontal cortex turn you into? Leads to what?
5. How are serotonin receptor affected by cortisol? Leads to what?
6. What condition occurs when a substance causes higher than normal levels of dopamine?
7. What happens if you do not receive reward? Will you get out of bed?
8. What are the differences between reward-pleasure and contentment-happiness?
9. What neurotransmitters are responsible for pleasure and happiness?
10. What is the post-synaptic affect to dopamine?
11. What is the post-synaptic affect to serotonin?
12. How will a post-synaptic neuron protect itself from death due to excess dopamine? Condition called what?
13. Why may dopamine kill a neuron but serotonin will not kill a neuron?
14. What down regulates serotonin?
15. Why do you have less happiness when you seek more pleasure?
16. What three events occur if you have a lack of dopamine?
17. What is the brain telling the drug addict if they can not get their drug of choice?
18. What area of the brain "lights up" to indicate survival behavior?
19. How will the brain light up for the following stimuli: dehydrated, starvation, drug craving?
19. What type of behavior occurs with craving?
20. How long will it take after the addict stops taking the drug for the craving to stop?
21. Why is methadone used to help patients recover from opioid use disorder?
22. What do you need to think when you hear dopamine? = motivation
23. What is the purpose for reducing craving? stop relapse
24. What is decision fatigue?
25. How may society help treat the opioid epidemic?
26. What is the key idea to take away from this video?