BIO 26 PAL Worksheet
Week 3 (#1): Action Potentials and ECG

The heart's contraction is initiated by self-depolarizing pacemaker cells. The electrical signal initiated by the pacemakers then leads to depolarization of the myocyes, which will in turn then execute the actual contraction.

You wake up with a start as a bright beam of light hits your face. The next thing you know is that you are strapped to a chair inside of an alien spaceship! You begin to panic as a creature seemingly made of green Jell-O approaches you.

1. "I'm sssssssssssorry about thisssssssss", the creature tells you in nearly perfect English. "But we found sssssssssssssome drugsssssssss in an abandoned sssssssssspace ship and wanted to sssssssssssseee what they could do." The jelly-creature grabs a syringe and injects something into your body. You feel the effect immediately – your heart is racing even faster than it had been.

Draw an action potential for a pacemaker cell and think about how this would look differently after the drug gets injected. Which branch of the autonomic nervous system do you think the drug mimics?

2. "It'sssssssss doing sssssssssssssomething!" the creature cries happily. "Hissssssssss heart is contracting sssssssssso fasssssst, sssssssssssssoon it will jusssssssssst sssssssstay contracted." You can't help but grin… "Wrong!" you think. As you remember information from your physiology class.

What feature in the heart prevents it from going into a state of constant contraction (tetanus)? Please include a drawing in your explanation.

3. Your excitement isn't long-lived. Your heart is beating so fast now that you feel like it's going to jump out of your chest. You feel yourself getting dizzy. "Not enough time for …." is your last thought before you faint. When you wake up, you notice that you've been hooked up to wires connected to an old computer. You recognize the waveforms of an ECG tracing.

A. Draw a typical ECG tracing and label all of the wave forms. Indicate what is happening electrically in the heart (depolarization/repolarization of the atria and ventricles). What are the SA and AV nodes? Indicate where on the tracing the SA node would depolarize, then indicate where the AV nodal delay would occur?

B. Next, draw an ECG tracing for a person experiencing tachycardia (faster than normal heart rate). Which segment of the ECG tracing changes the most compared to normal? What happens during this segment? Use this information to explain why are you feeling dizzy/why might you faint in this situation?

4. You try to calm yourself down by concentrating on the QRS complexes on the screen. You've never had an ECG done before and are fascinated by the fact that you can predict when your ventricles will contract. It happens slightly after each QRS complex. Make an overview drawing of what is occurring inside a myocyte from the time of depolarization (QRS) to actual contraction.

5. Watching the screen must have put you to sleep. When you wake up, you're back in your own bed. Was this all just a dream? You turn on the light on your night stand and then you see it: a card with green writing on it.

THANKSSSSS!
WE ♡ U
THE ALIENS

BONUS: Does love arise in the ♡ ?