Cardiac Electrophysiology and Mechanics Study/Thought Questions

Bio390

A. Cardiac Electrophysiology

Make an electrical diagram using Ca^{++}, Na^{+} and K^{+} batteries for a myocardial cell and a nodal cell. Include appropriate conductances (the ones we have talked about in class) and indicate whether these conductances are fixed or variable; include the appropriate pumps, membrane capacitance, and a voltmeter. Below the graph, indicate which conduction pathways are for polarizing the cell, which are pacemaker pathways and which are associated with initial and/or plateau depolarizations.

What is the significance of preferred conduction pathways (and how do preferred pathways differ from general myocardial conduction)? What are the structural and functional features of preferred conduction pathways?

B. Cardiac Mechanics

Try the following:

- Assume that the left side's stroke volume is 50 mL.
- If the pulmonary artery blood pressure is 30/20 mmHg, construct an accurate work loop diagram and label the opening and closing of the pulmonary and the tricuspid valves and the approximate beginning of the atrial contraction.
- What is the effect of increased β stimulation on this graph, after a couple of beats? You won't be able to do this quantitatively but think about changes that might occur in the end systolic volume, stroke volume and force of contraction.