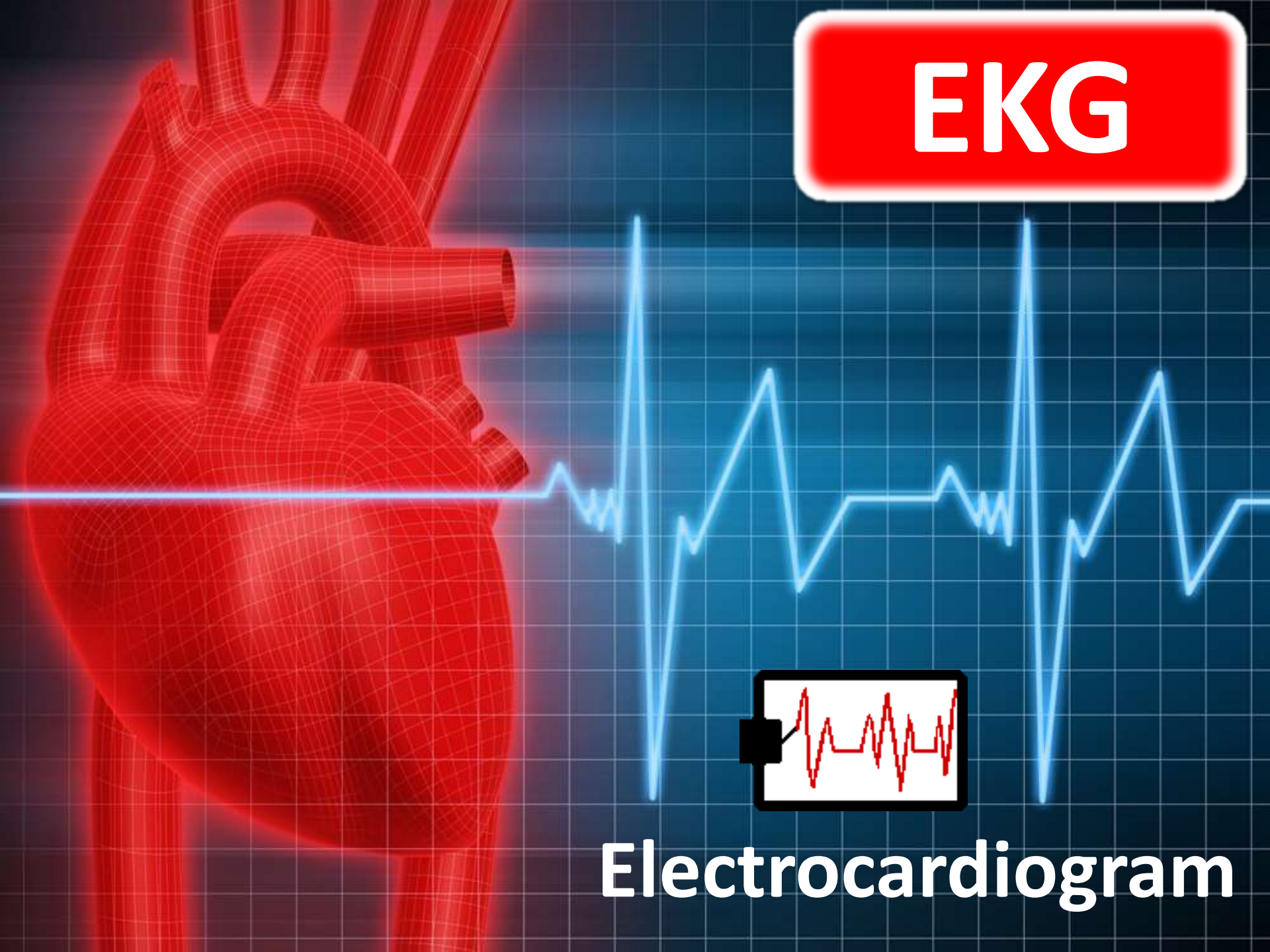


EKG



Electrocardiogram

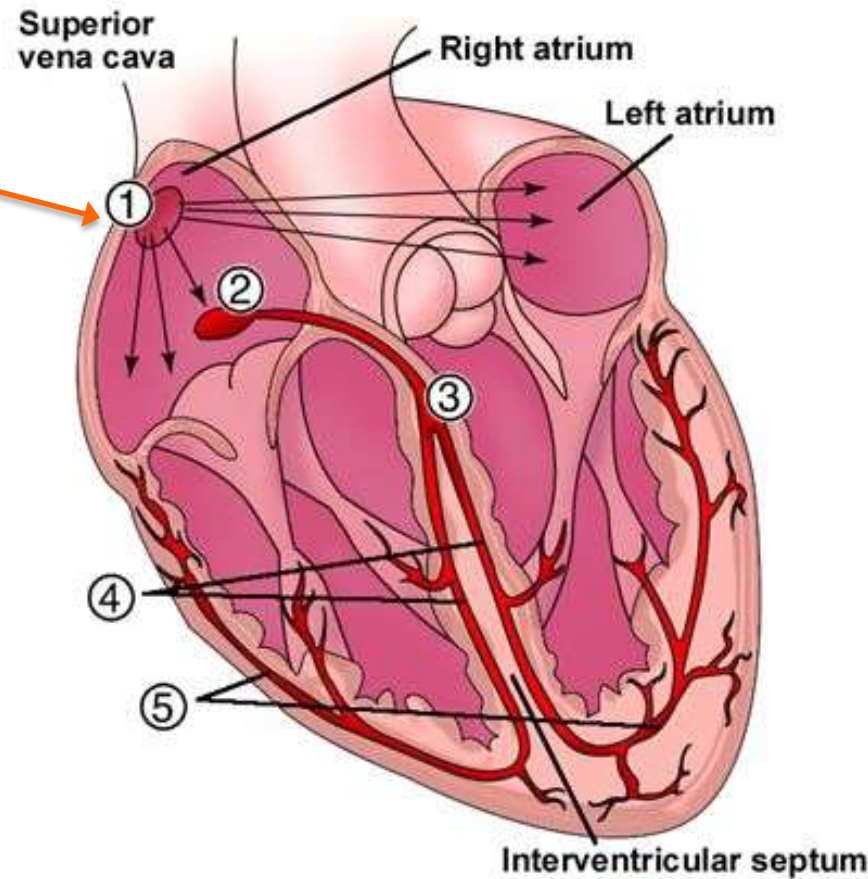
Maintaining the Heart's Rhythmic Beat

- Some cardiac muscle cells are self-excitabile, meaning they contract without any signal from the nervous system



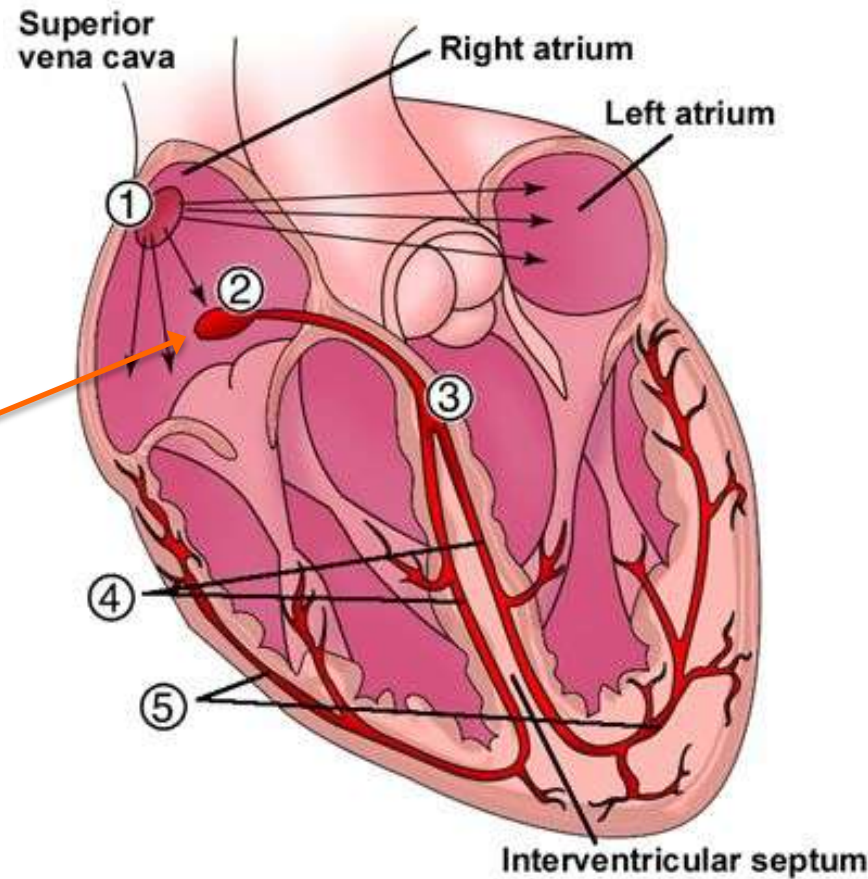
Maintaining the Heart's Rhythmic Beat

- The sinoatrial (SA) node, or pacemaker, sets the rate and timing at which cardiac muscle cells contract



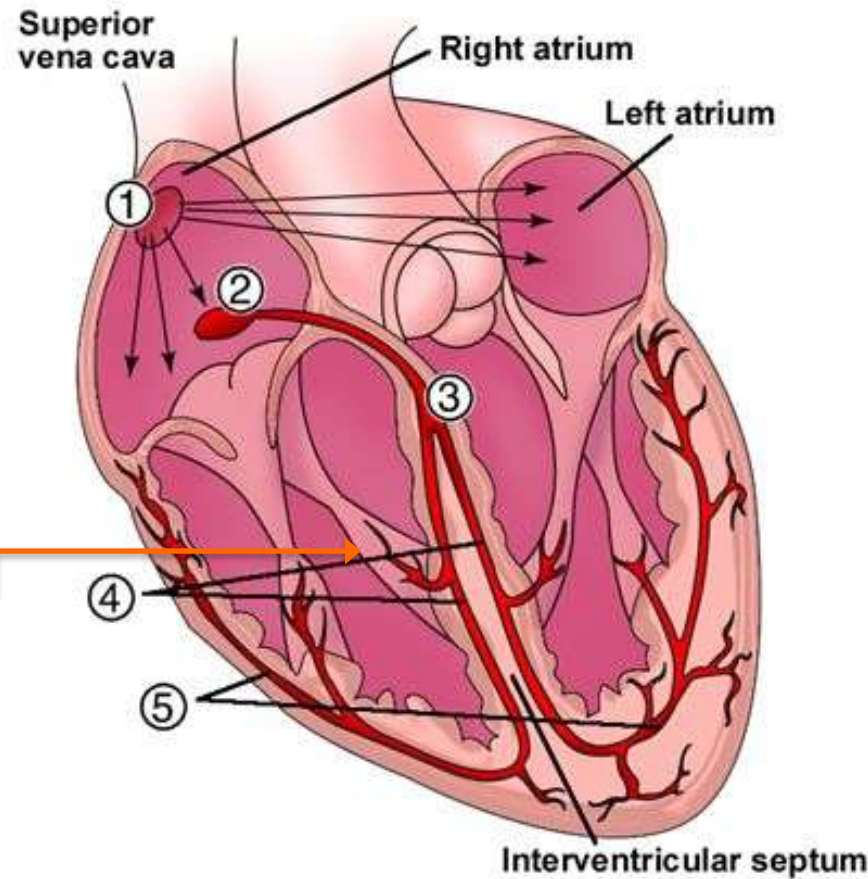
Maintaining the Heart's Rhythmic Beat

- Impulses from the SA node travel to the atrioventricular (AV) node



Maintaining the Heart's Rhythmic Beat

- At the AV node, the impulses are delayed and then travel to the Purkinje fibers that make the ventricles contract



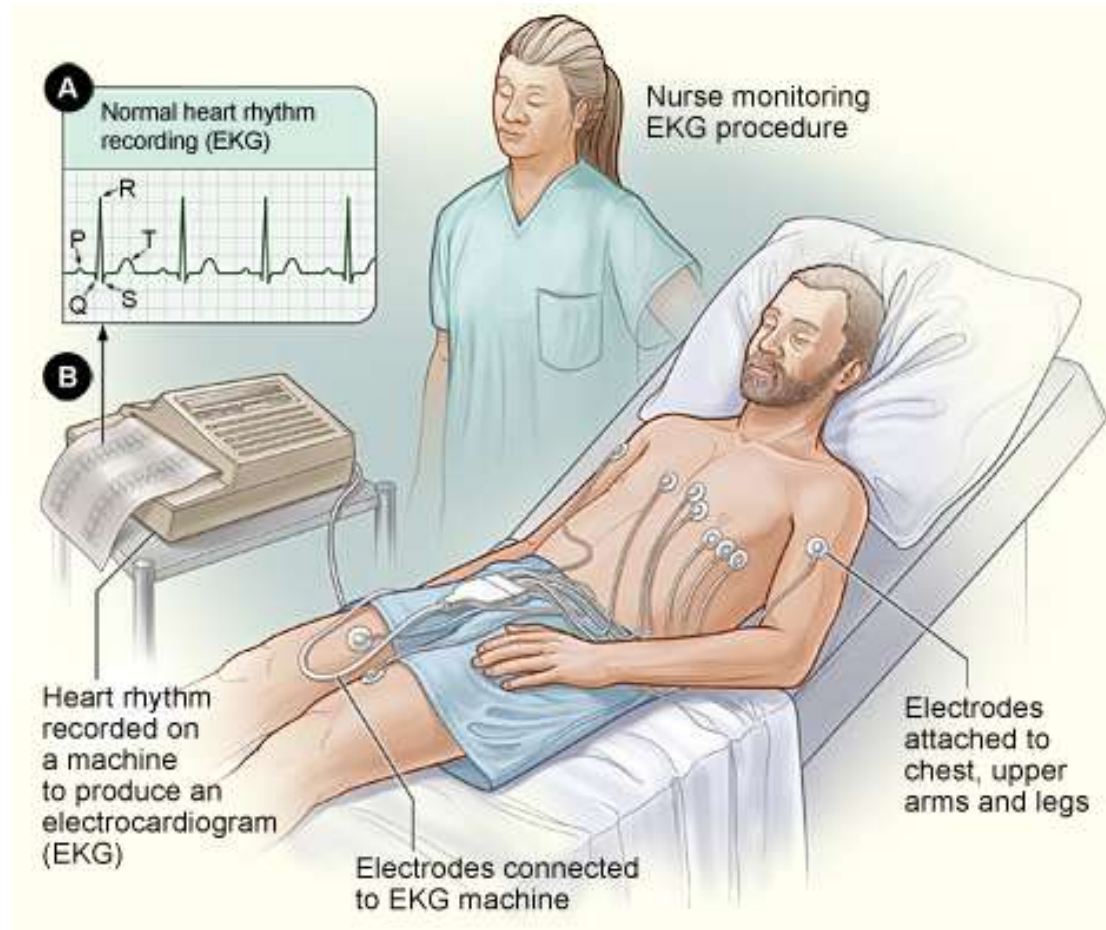
What is an EKG?

- Impulses that travel during the cardiac cycle can be recorded as an electrocardiogram (ECG or EKG)



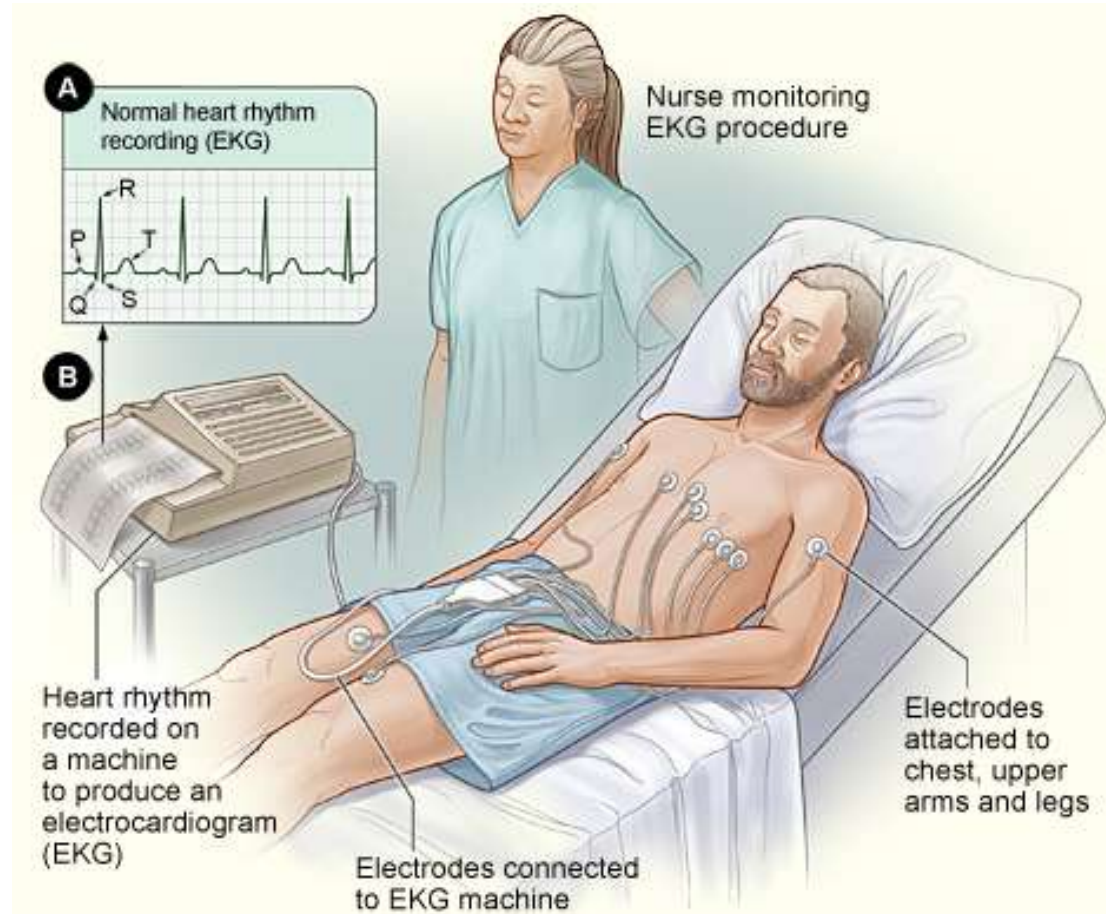
How is an EKG recorded?

- An EKG machine is used to record the electrical activity of the heart.



How is an EKG recorded?

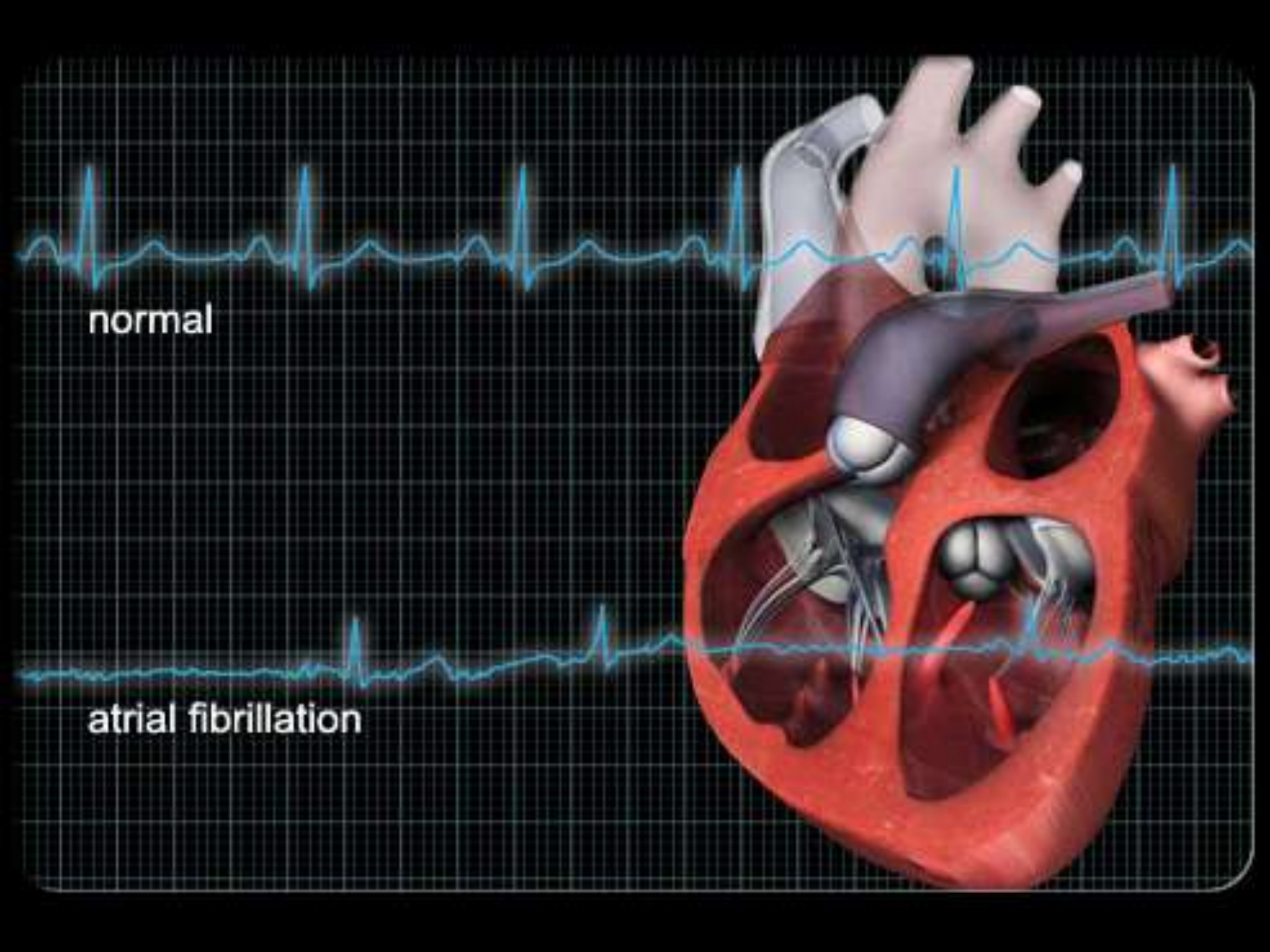
- Typically, 10 electrodes are placed on the patient.



What is the purpose of an EKG?

- EKGs are used to detect issues with the electrical system of the heart.
- An arrhythmia is a problem with the rate or rhythm of the heartbeat. During arrhythmia, the heart can beat too fast, too slow, or irregularly.



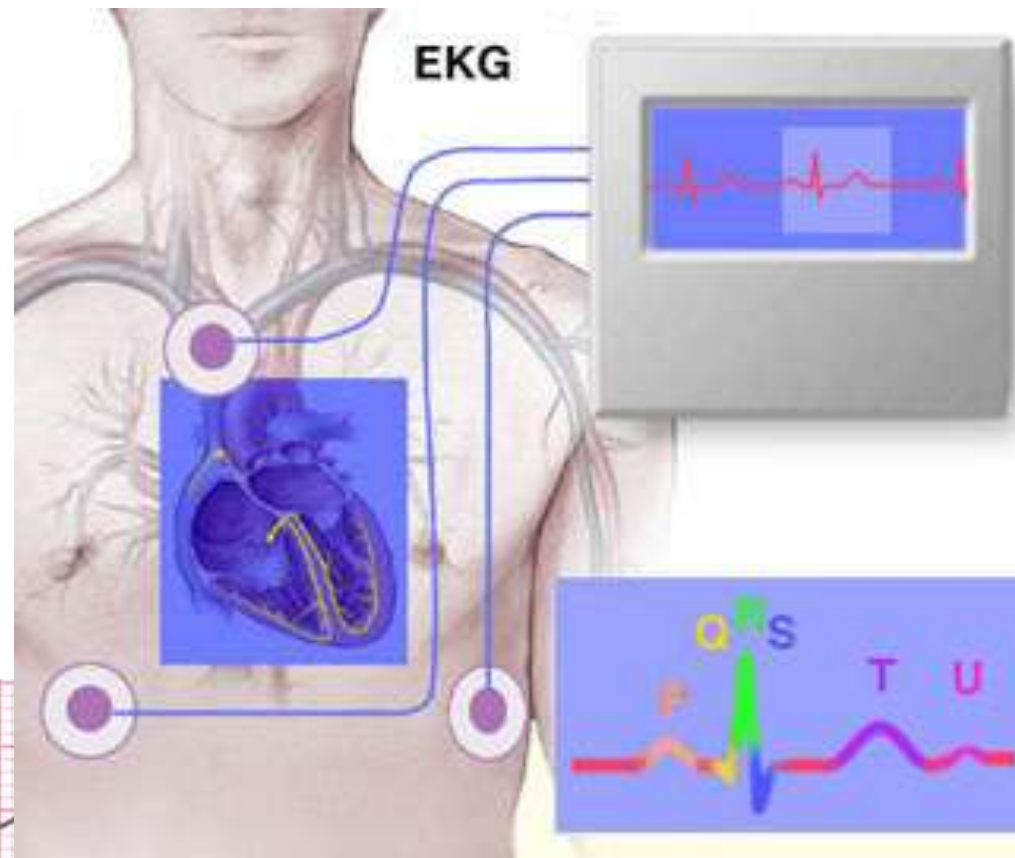


normal

atrial fibrillation

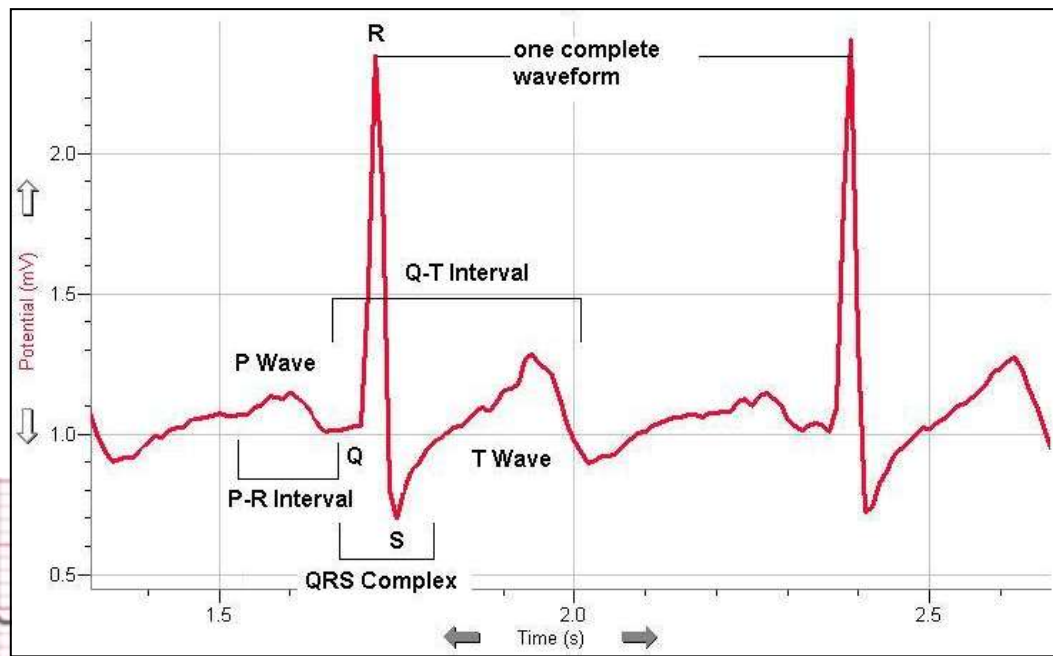
What does the EKG Strip tell you?

- The EKG breaks down each heartbeat into a series of electrical waves.
- The P wave, the QRS complex, and the T wave are associated with the heart's contractions.



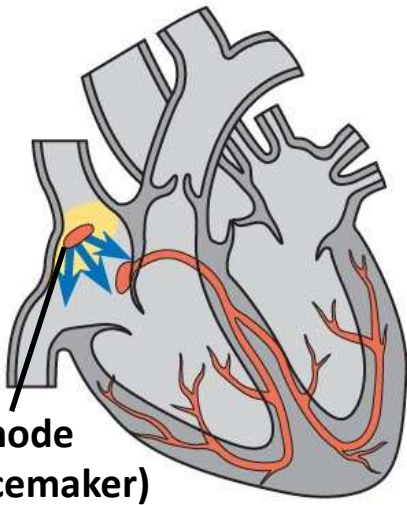
What does the EKG Strip tell you?

- The P wave reflects activity in the heart's upper chambers (atria).
- The QRS complex and the T wave reflect activity in the lower chambers (ventricles).

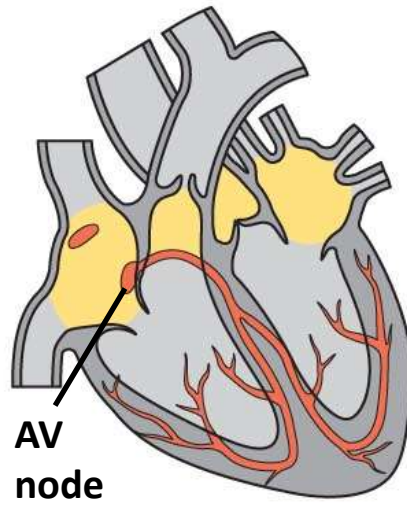


What does the EKG Strip tell you?

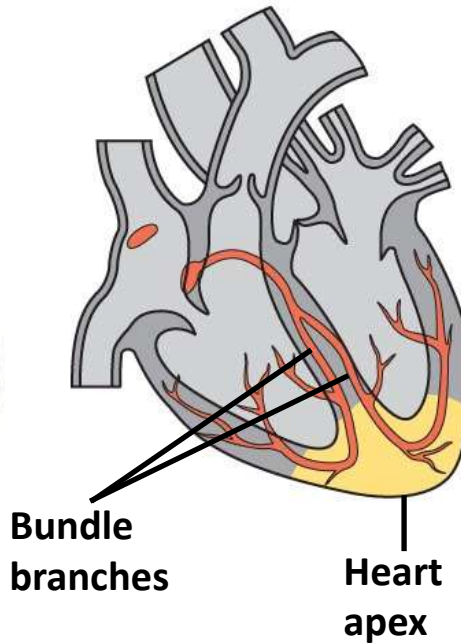
- 1** Pacemaker generates wave of signals to contract.



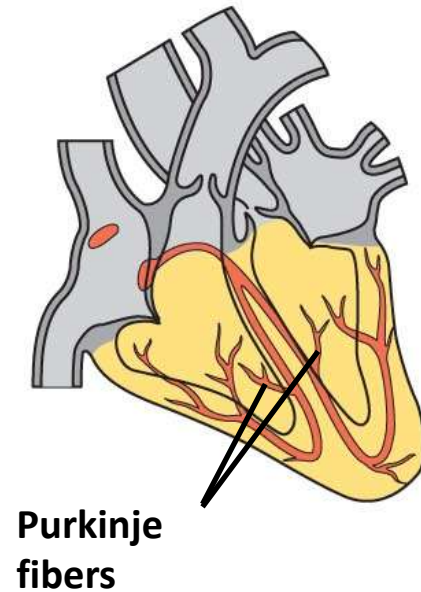
- 2** Signals are delayed at AV node.



- 3** Signals pass to heart apex.



- 4** Signals spread throughout ventricles.



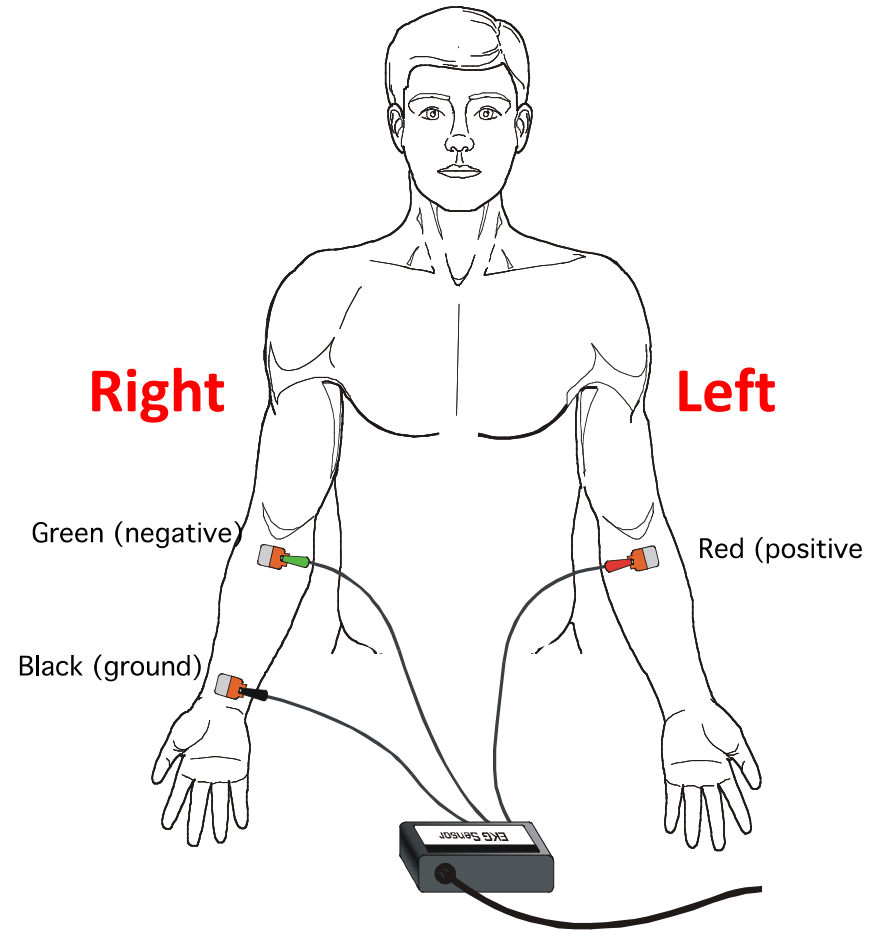
What does the EKG Strip tell you?

- EKGs are influenced by nerves, hormones, body temperature, exercise, etc.



Your Lab

- Connect the EKG Sensor to LabQuest and set up the sensor.
- Attach three electrode tabs to your arms as shown in the diagram.



Your Lab – Part I

- Connect the three sensor leads to the electrode tabs.
- The subject should lay flat on top of a lab table with their arms resting on the table.
- Rest for 3 minutes.



Your Lab – Part I

- After the resting period, another member of the lab group should start data collection.
- Data will be collected for three seconds and then a graph will be displayed.
- If the EKG is not satisfactory, repeat the EKG or switch subjects before you move on to Part 2.
- Follow the directions in the lab to analyze the data and record it in Table 1.

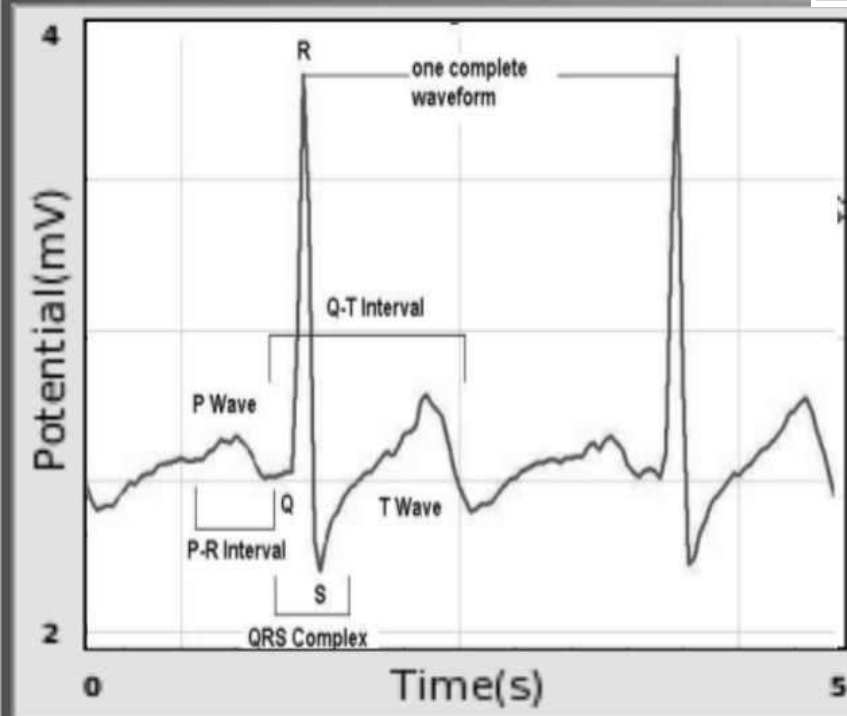


Your Lab – Part I

Table 1

Interval	Average Time
P - R	
QRS	
Q - T	
Heart Rate	_____ beats/min

File Graph Analyze



Run 1

Potential 2.363 mV

Time 0.50 s

Average Time:

$$P - R = R - P$$

$$QRS = S - Q$$

$$Q - T = T - Q$$

Heart Rate:

Remember the total time is three seconds

Your Lab – Part II

- Repeat the experiment after running in place for one minute to complete the Extension Activity (**same subject**).
- Electrode tabs should remain on the subject during exercise, but the sensor leads should be removed.
- The subject should sit to have their EKG taken for Part 2.



Your Lab – Part II

- Compare the maximum heart rate of the subject with the two formulas provided:
 - Theoretical (using subject's age)
 - Experimental (using the Q – T Interval)



Your Grade

- **Conclusion** = 10 Points
- **Questions** = 8 Points Each
- **Rubric on Technology Literacy** = 4 Points Each
 - This is the final lab of the year that utilizes the Vernier LabQuest. By now, you should be comfortable using the LabQuest for data collection and analysis. Your group will be evaluated on its use of this technology using the following rubric.



Your Grade

Level of Performance:	4 = Exemplary	3 = Proficient	2 = Developing	1 = Beginning
Gathering and Evaluating	Applies digital tools to gather, evaluate, and use information independently.	Applies digital tools to gather, evaluate, and use information with minimal assistance.	Applies digital tools to gather, evaluate, and use information with teacher support.	Does not apply digital tools to gather, evaluate, and use information even with teacher monitoring.
Effectiveness and Productivity	Demonstrates substantial understanding of the Vernier LabQuest.	Demonstrates understanding of the Vernier LabQuest.	Demonstrates partial understanding of the Vernier LabQuest.	Demonstrates no understanding of the Vernier LabQuest.

Helpful Hints

- Your EKG Sensor may not auto-connect
 - Sensors → Sensor Setup → Channel 1 → EKG
- Zooming in will probably make it easier to identify the different waves of the EKG
 - Click and drag with the stylus to select two complete heartbeats (P-T) → Graph → Zoom In
- Using the left and right arrow keys will allow you to cycle through each data point (sometimes easier than using the stylus)
- To reduce interference: shut off cell phones and subject holds EKG Sensor box in their hands