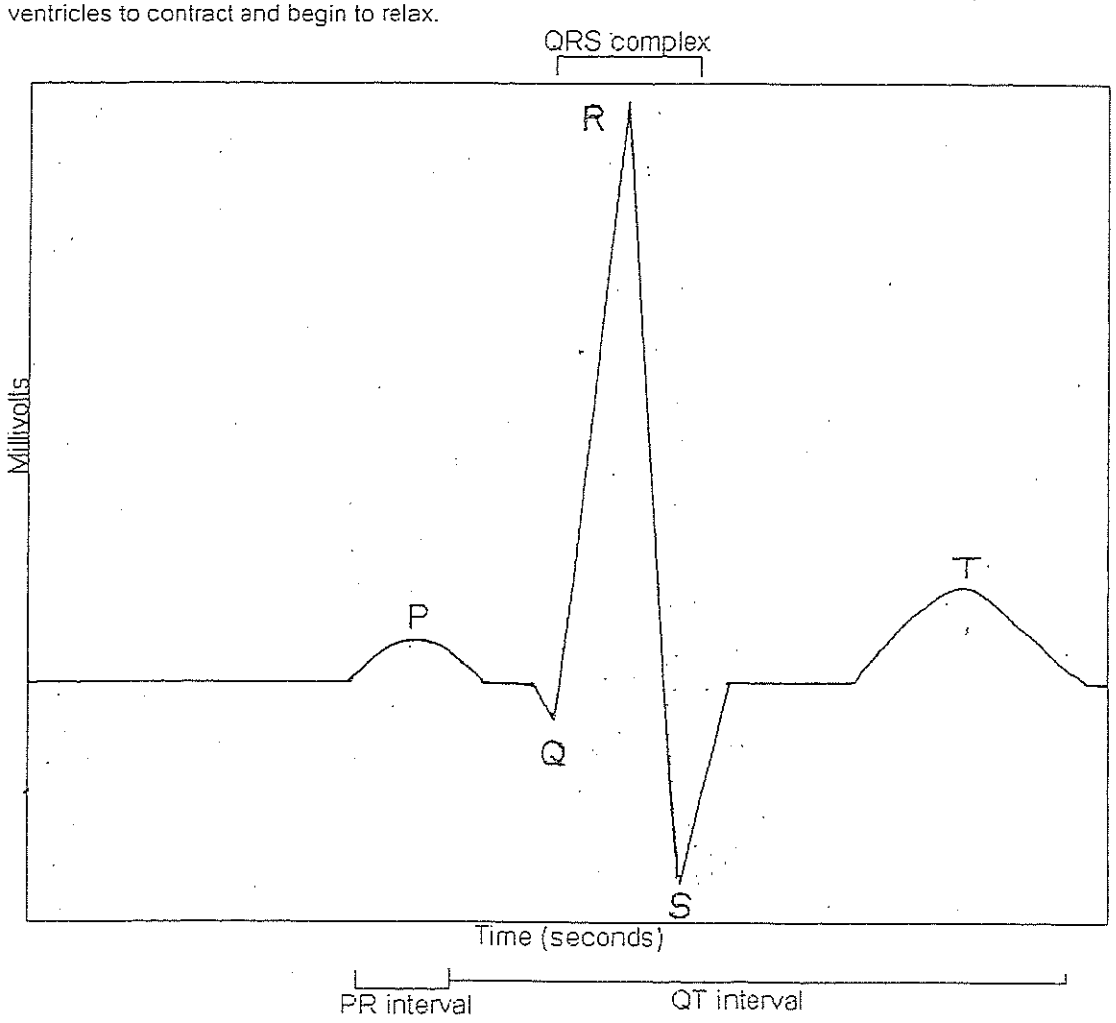
Plan and perform an investigation to identify individual aspects that comprise the heartbeat.

The normal ECG consists of a P wave, a QRS complex, and a T wave. The P wave, which is the result of action potentials that cause depolariztion of the atrial myocardium, signals the onset of atrial contraction. The QRS complex is composed of three individual waves: the Q,R, and S waves. The QRS complex reults from ventricular depolarization and signals the onset of ventricular contraction. The T wave represents repolarization of the ventricles and precedes ventricular relaxtion. A wave representing repolarization of the atria cannot be seen because it occurs during the QRS complex.

The time between the beginning of the P wave and the beginning of the QRS complex is the PQ interval, commonly called the PR interval because the Q wave is often very small. During the PR interval, which lasts approximately 0.16 seconds, the atria contract and begin to relax. The ventricles begin to depolarize at the end of the PR interval. The QT interval extends from the beginning of the QRS complex to the end of the T wave, lasts approximately 0.3 seconds, and represents the approximate length of time required for the ventricles to contract and begin to relax.

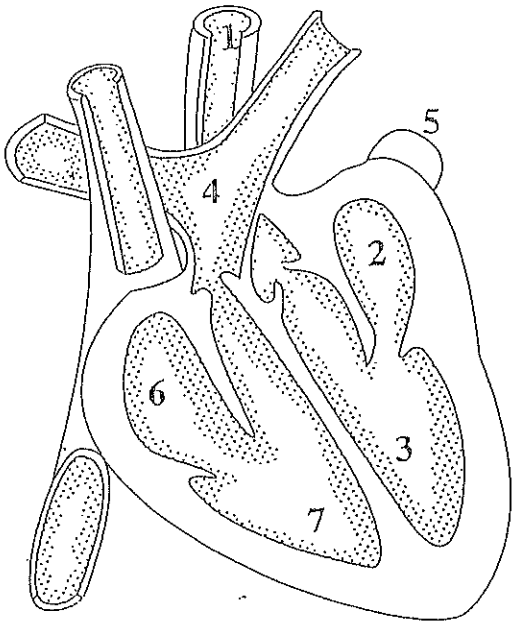


Wave on graph	Electrical activity in heart	Effect
P wave	Electrical signal makes ..... contract.	Blood is forced into ..... .
QRS wave	Electrical signal makes ..... contract.	At the same time the valves between ..... and ..... close (lub) so blood can not flow back into ..... and it is pumped into the ..... .
T wave	Electrical signal	Recovery wave, ... relax. Valves between ..... and ..... close (dub).

1)

Parts of the Heart.

- Label the parts of the Heart.
- This is a diagram of a human heart.



1 _____
2 _____
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My Mark: ___/7

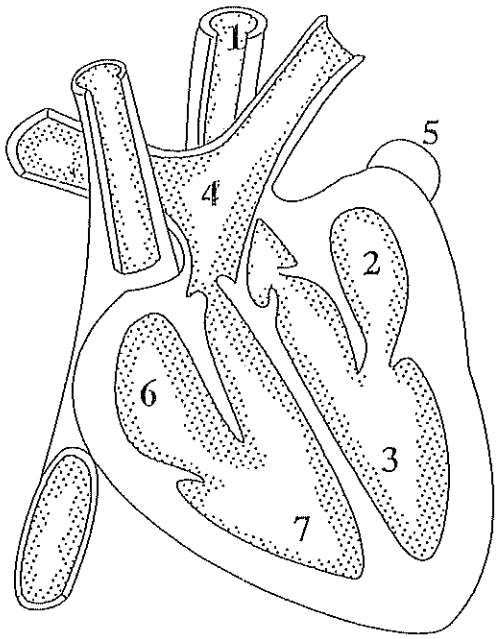
(2)

Name: _____

Blood Flow Through the Heart.

- Using lines and arrows indicate the path of the blood through the heart.

This is a diagram of a human heart.



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THE HEARTBEAT

The cardiac cycle is divided into TWO major phases:

1. The period of ventricular contraction (SYSTOLE) followed by,
2. The period of ventricular relaxation (DIASTOLE)

Two heart sounds are normally heard through a stethoscope placed on the chest wall. The first sound, a low pitched LUB, is associated with the closure of the atrioventricular valves(between the atria and the ventricles) at the start of systole (the blood has moved from the atria to the ventricles, the ventricles begin to contract causing the valves to snap shut so that backflow is prevented).

The second sound, a high pitched DUB, is associated with the closure of the pulmonary and aortic valves at the start of DIASTOLE (the blood has moved from the ventricles into the arteries and the ventricle begins to relax).

More detailed information about the heartbeat can be obtained by measuring the heart's electrical activity. Electrodes are used to detect electrical impulses from the heart and these are printed out as graphs called ELECTROCARDIOGRAMS (ECG)

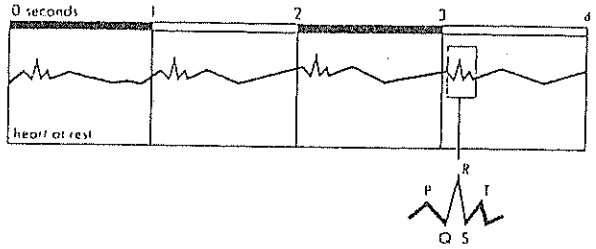

FIGURE 2.23
ECG records the electrical activity of the heart. Points on the graph are labelled P, Q, R, S and T. At P, the atria contract. The Q, R, S and T sections show the electrical activity of the heart before the ventricles contract. If you were listening to the heart with a stethoscope, you would hear different noises—a loud 'lub' sound during the QRS part of the graph is caused by the atrioventricular valves closing. A softer 'dub' sound during the T period, when the pulmonary and aortic valves close.

Because many heart defects alter normal electrical impulse propagation and thereby change the shape of the PQRST waves the ECG is a powerful tool for the diagnosing of heart disease.

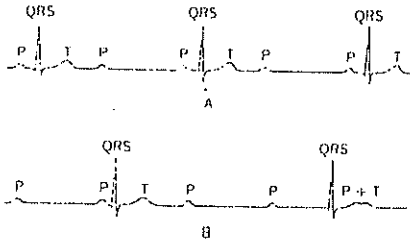

Figure 11-21. Electrocardiograms from two persons suffering from atrioventricular block. (A) Partial block; one-half of the atrial impulses are transmitted to the ventricles. (B) Complete block, there is absolutely no synchrony between atrial and ventricular electric activities.

MEDICAL TEST

Resting electrocardiogram (ECG, EKG)

Diagnostic Value: Performed to evaluate possible symptoms of heart disease (chest pain, palpitations, dizziness, faintness), to detect abnormal cardiac rhythms and conduction patterns, to follow the course of recovery after a heart attack, to monitor the effectiveness and side effects of certain drugs that might affect the heart, to check the functioning of artificial pacemakers, and to evaluate the status of the heart prior to surgery. Some physicians include an ECG as part of a routine physical examination for individuals over 40. In addition to its screening value, this baseline ECG might be compared with a subsequent ECG done after onset of symptoms. Although an ECG monitors cardiac status, it does not detect all instances of heart disease, and it cannot predict what cardiac event might occur in the future.

Procedure: The wrists, ankles, and chest are cleansed with alcohol to remove skin oils and perspiration. Then the cleansed areas are dabbed with a special jelly or paste to improve electrical conduction. Next, metal electrodes, or leads, are attached to each arm and leg with rubber straps. By small rubber suction cups, other electrodes are placed on the chest. Once the electrodes are in place, the person is asked to remain quiet and still. The electrocardiograph is started, and the electrical impulses generated by the heart and detected by the electrodes are amplified by the machine and converted to a recording pen that graphs the impulses as a series of up-and-down wavy lines called *deflection waves*. Each portion of the cardiac cycle produces a different electrical impulse. The test requires only a few minutes.

The standard ECG is referred to as a 12-lead ECG, since 12 different tracings (electrical "views" of the heart) are recorded from the limb and chest leads. The 12 tracings provide a comprehensive view of the electrical activity of the various regions of the heart.

MEDICAL TEST

Stress electrocardiogram (ECG), or stress test

Diagnostic Value: To determine the cause of unexplained chest pain or to evaluate the severity of heart disease, as after recovery from myocardial infarction. Monitoring of the capacity of the heart to withstand rigorous exercise is one of the most frequent indications for stress testing. In this regard, stress testing is used to identify arrhythmias that occur during exercise and evaluate the effectiveness of antianginal or antiarrhythmic therapy.

Procedure: Several ECG electrodes are placed on the chest, and a sphygmomanometer is wrapped around the arm. Then the subject begins to exercise on a moving treadmill or stationary bicycle. As the test progresses, the speed and/or incline of the treadmill is increased, or the speed and resistance of pedaling is increased. During the test, which usually lasts from 15 to 30 minutes, ECG, heart rate, and blood pressure are monitored. After the test, monitoring is continued for at least 5 to 10 minutes.

Various types of heart problems can arise from interruptions to the normal rhythm of contraction and relaxation of the heart. ARRHYTHMIAS(irregular heartbeats) of various kinds can cause the heart to pump less effectively. An arrhythmia includes a heartbeat that is too slow (BRADYCARDIA), too fast (TACHYCARDIA) or irregular (FIBRILLATION)

BRADYCARDIA may be caused by SA node disease or heart block. In SA node disease the SA node loses the ability to initiate the heartbeat or increase the heart rate in response to circulation demands. It sends the signals out too slowly. In response to this other heart tissue may attempt to take over which results in an irregular heartbeat. Heart block is a condition in which signals are blocked from traveling normally from the atria to the ventricles.

A slow heart beat may cause fatigue, shortness of breath, lightheadedness or fainting.The most common factors which cause brachycardia include hereditary heart defects, illness, Effects of cardiac drugs and past heart attacks.

TACHYCARDIA can result in palpitations, dizziness, lightheadedness or sweating.

FIBRILLATION is an extreme form of arrhythmia characterised by very rapid, irregular, shallow contractions. In the ventricles it is life threatening because blood isn't delivered to the body effectively. This may be resolved by electrical shock. Fibrillation in the atria may lead to blood clots. The blood is not pumped out of the atria fully and this causes the pool and clot.