

1 Depolarization of atrial contractile fibers produces P wave

Seconds





3 Depolarization of ventricular contractile fibers produces QRS complex









5 Repolarization of ventricular contractile fibers produces T wave













CARDIAC CYCLE

A single **cardiac cycle** includes all the events associated with one heartbeat. Thus, a cardiac cycle consists of systole and diastole of the atria plus systole and diastole of the ventricles.



A cardiac cycle is composed of all the events associated with one heartbeat.



HEART SOUNDS : LUBB & DUBB

Figure 20.15 Heart sounds. Location of valves (purple) and auscultation sites (red) for heart sounds.



(b) Listening to sounds within the body is called auscultation; it is usually done with a stethoscope.



Anterior view of heart valve locations and auscultation sites

The first sound S1 **lubb** sound is caused by blood turbulence associated with closure of the AV valves soon after ventricular systole begins.

The second sound (S2), which is shorter and not as loud as the first, can be described as a **dupp** sound. S2 is caused by blood turbulence associated with closure of the SL valves at the beginning of ventricular diastole.

Normally not loud enough to be heard, S3 is due to blood turbulence during rapid ventricular filling

S4 is due to blood turbulence during atrial systole.

CARDIAC OUTPUT

Cardiac output (CO) is the volume of blood ejected from the left ventricle (or the right ventricle) into the aorta (or pulmonary trunk) each minute. Cardiac output equals the stroke volume (SV), the volume of blood ejected by the ventricle during each contraction, multiplied by the heart rate (HR), the number of heartbeats per minute:

CO	=	SV	\times	HR
(mL/min)		(mL/beat)		(beats/min)

In a typical resting adult male, stroke volume averages 70 mL/beat, and heart rate is about 75 beats/min. Thus, average cardiac output is

CO = 70 mL/beat × 75 beats/min = 5250 mL/min = 5.25 L/min

REGULATION OF HEART RATE : NERVOUS CONTROL

Figure 20.16 Nervous system control of the heart.

The cardiovascular center in the medulla oblongata controls both sympathetic and parasympathetic nerves that innervate the heart.



Figure 20.17 Factors that increase cardiac output.

G _____ Cardiac output equals stroke volume multiplied by heart rate.

