

Cardiac Cycle: One cardiac cycle is equivalent to one complete heartbeat, it repeats two alternating phases: 1. Contraction—forcing blood out of the heart (systole) 2. Relaxation, allowing the heart to refill with blood (diastole). During the diastolic phase, the ventricles relax and fill with blood. Deoxygenated blood enters the right atrium from the vena cava and passes through the tricuspid valve to the right ventricle. The pulmonary valve is closed during this time, keeping the blood in the right ventricle. Simultaneously, oxygenated blood enters the left atrium from the pulmonary vein and passes through the mitral (bicuspid) valve into the left ventricle. The aortic valve is closed during this time, keeping the blood in the left ventricle. Following this relaxation and filling period is the systolic phase, in which the ventricles contract. The right ventricle contracts to force the blood through the pulmonary valve into the pulmonary artery, which carries the blood to the lungs for oxygenation. The tricuspid valve is closed at this time to prevent the backflow of blood into the right atrium. Simultaneously, the left ventricle contracts to force the blood through the aortic valve into the aorta—which then circulates the oxygenated blood to all parts of the body. The mitral (bicuspid) valve is closed at this time to prevent the backflow of blood into the left atrium. The heart contracts every second of every day throughout one's life. The normal healthy heart beats continuously, resting only 0.4 second between beats. The heart and blood vessels conjoin to pump and circulate the equivalent of 7,200 quarts of blood through the heart over a 24-hour period—approximately 5 quarts per minute at the rate of 80 beats per minute. Arterial pulse and Blood pressure The term pulse refers to the alternating of pressure (expansion and then recoil) in an artery that occur with each contraction and relaxation of the left ventricle. This difference between systolic and diastolic pressure is called the pulse pressure. Normally the pulse rate (pressure variation per minute) equals the heart rate (beats per minute). It is measured at different parts of the body, most common part: 1. Radial artery in the wrist. 2. Brachial artery in the elbow. When you examine the arterial pulse, you are going to study the following characteristics: 1–Heart rate: number of beats/ minutes 2–Rhythm: regularity of intervals Character of the pulse wave. Radial Pulse Rate: to measure the pulse at the wrist. Place the index & middle finger over the underside of the opposite wrist, below the base of the thumb. Press firmly with flat fingers until you feel the pulse in the radial artery. Once you feel the beats at a pulse point like the inside of the wrist, count the pulse waves for 30 seconds, and multiplies this # by two. This is the per-minute total. If the rate is very slow, fast, or irregular then it is suggested that you count for a full minute. Normal range: 60 – 100 beat / minute, Average radial pulse: 73 beats \minute in the resting state. Abnormal rates could be: ☐ Bradycardia (rate below normal) Below 60. ☐ Tachycardia (rate above normal) above 100. Rhythm: can be classified into 2 categories 1. Regular. 2. Irregular. Character of the pulse wave Blood pressure: is the pressure exerted by circulating blood upon the walls of arteries. During each heartbeat, blood pressure varies between a maximum (systolic) and a minimum (diastolic) pressure. The systolic pressure (SBP): is the maximum arterial pressure reached within ventricles (contraction of the left ventricle). The top number. The ideal range is 90–120 mm Hg. The diastolic pressure: (DBP) is the lowest arterial pressure resulting from left ventricle relaxation (the bottom number). The ideal range is 60–80 mm Hg. Recording of these pressure changes within the heart is known as measuring the blood pressure. Blood pressures are reported in millimeters of mercury (mm Hg), with the systolic pressure appearing first; 120/80 translates to 120 over 80, or a systolic pressure of

120 mm Hg and a diastolic pressure of 80 mm Hg. Common factors that influence blood pressure are as follows: 1. Age, gender, time of day, body position, exercise, emotional status, medication. 2. Medical and family history Social habits (i.e., smoking and alcohol consumption) 3. Disease (i.e., kidney, metabolic, or congestive heart failure) Blood pressure is measured in the peripheral artery of arm (usually in the brachial artery). Normal range BP for adult 120 /80 mmHg. Materials A–Mercuric sphygmomanometer which Consist of 1. Cuff: a rubber bag 2. inflator: rubber bulb with one valve that control the pressure inside the system. 3. Pressure indicator: Hg manometer. B–Stethoscope. How is blood pressure measured? To measure both systolic & diastolic blood pressure by auscultatory method, you need a sphygmomanometer & stethoscope, it is important that the subject is relaxed and rested for at least 5– 10 minutes before having his blood pressure taken. Deflate the cuff and place it around the upper arm so it fits snugly, but not too tightly, If you're right handed, you should hold the bulb/pump in your left hand to inflate the cuff, Put the head of stethoscope just under the edge of the cuff, a little above the crease of the person's elbow. Hold it there firmly with your right hand Put the earpieces of the stethoscope in your ears. inflate the cuff with brisk squeezes of the bulb. Watch the pressure manometer as you do it. For most adult people, you shouldn't need to go over 180 mm Hg. At 180 mm Hg, slightly open the valve on the air pump. It's important that you don't let the air out too suddenly or too slowly. Then pay attention *very carefully* to what you hear through the stethoscope as the mercury column falls The first time you hear the sound (Korotkoff sound), note what the reading was on the pressure manometer. This value represents the systolic blood pressure. The sound should continue and become louder in intensity. Note the pressure reading when you hear the sound for the last time. This value represents the diastolic blood pressure. Afterwards, open the air valve completely to release any remaining pressure. Which Arm to Use? You can usually use either arm for BP measurement but. you should avoid doing BP on an: Arm with injury, Arm with IV site, Arm that has a vascular access for dialysis. Blood Pressure Tips Too–narrow cuff will cause a false high reading. Too–wide cuff will cause a false low reading. Arm above heart level during reading will cause false low reading. Muscle contracted on arm during BP reading will cause a false high reading. Arm pressures should not differ more than 10 mm Hg. Initiating activity: The cold pressor test: Blood pressure is affected by emotions and pain. This ability of blood pressure will be investigated through use of the cold pressor test, in which one hand will be immersed in unpleasantly (even painfully) cold water. 1. Measure the blood pressure of the subject as he or she sits quietly. 2. Obtain a basin and thermometer, fill the basin with ice cubes, and add water. 3. When the temperature of the ice bath has reached 5°C, immerse the subject's other hand (the non–cuffed limb) in the ice water. 4. With the hand still immersed, take blood pressure readings at 1–minute intervals for a period of 3 minutes, and record the values. How did the blood pressure change during cold exposure? Subtract the respective baseline readings of systolic and diastolic blood pressure from the highest single reading of systolic and diastolic pressure obtained during cold immersion. (For example, if the highest experimental reading is 140/88 and the baseline reading is 120/70, then the differences in blood pressure would be systolic pressure, 20 mm Hg, and diastolic pressure, 18 mm Hg.) These differences are called the index of response. According to their index of response, subjects can be classified as follows: ☞ Hypo–reactors (stable blood pressure): Exhibit a rise of diastolic and/or

systolic pressure ranging from 0 to 22 mm Hg or a drop in pressures. ☒ Hyperreactors (labile blood pressure): Exhibit a rise of 23 mm Hg or more in the diastolic and/or systolic blood pressure