H E A R T A T T A C K

INTRODUCTION :

HEART ATTACK is a three part program which puts you in control of a sophisticated working model of the human circulatory system. The program begins with an introduction to the parts of the circulatory system. As each part is displayed, accompanying documentation describes its function in the circulatory system. When the system is complete, the program moves to its second part, within which you may experiment with any of the controlling mechanisms, to become familiar with the consequences, the indicator reactions, and the visual clues accompaning a change in any controller mechanism status. When you feel you are familiar with the controls and functions of the parts of the system, you may direct the program to its third part, the game, 'Heart Attack'. The game begins when you use your cursor, (in the form of a nerve cell), to set the level of play to an appropriately difficult level. As game play proceeds you must use the skills developed in the experimental part of the program to determine and correct damage produced by attack from deadly germs and heart seizures. You must use your White Blood Cells to fight germs, your Neuron (nerve cell) to stimulate and repair the damaged parts of the system, and your Platelets to stop bleeding caused by some of the nastier germs. All of this is done to keep your Red Blood Cells moving through the circulatory system, as they carry oxygen to all the cells of the body. Game score is measured by the total number of liters of blood pumped by the heart before that final 'Heart Attack'.

EDUCATIONAL OBJECTIVES:

HEART ATTACK provides a detailed working model of the circulatory system which will foster learning of the major parts and functions of the heart, the circulatory system, blood cell types, and the nervous controls of the circulation.

DIRECTIONS FOR GAME PLAY:

Instructions for game play are divided into three main sections. Section One describes the major parts of the circulatory system and their functions. (It is advised that the user read along with this section of the documentation as the system is "built" on the monitor screen.) Section Two describes the controlling mechanisms of the game and guides the user to experiment with each of these mechanisms to see how its use affects the system. Section Three provides instructions for beginning the game and also some strategy for effective game play.

HEART ATTACK, while a sophisticted model, is simple to play. The following instructions will provide all necessary background information. We hope you enjoy this simulation and welcome your comments.

TO BEGIN:

Follow the enclosed "LOADING INSTRUCTIONS" to Load and Run the program. When the program begins a tone will sound and the screen will display, "*START*". As you read the following documentation, press any key to continue whenever you see: "*PRESS*". Each part of the system will be described below as it is displayed on your monitor screen.

PART ONE - SYSTEM CONSTRUCTION:

PRESS

RIGHT ATRIUM - The heart is made of 4 small, muscular pumps. These pumps work together to pump blood through your entire body. The Right Atrium is one of these 4 pumps. As blood returns to the heart after its journey through the body, it enters the Right Atrium to begin the journey again.

PRESS

RIGHT VENTRICLE - The Right Atrium pumps blood into the Right Ventricle, the second of the 4 heart pumps. The atrium pumps with enough force to fill the ventricle to the point of stretching. This stretching of the ventricle helps to pump the blood with greater force than if the ventricle was not stretched by the atrium's pumping action.

PRESS

VENA CAVA VEIN - The Veins are a network of 'pipe-like' tubes carrying blood from the cells of the body, back to the heart. As the veins get closer to the heart, they connect to form larger veins. The Vena Cava is the largest vein in the body, connecting directly to the heart. The Vena Cava has two main sections, the Superior Vena Cava which carries blood from the upper body to the heart, and the Inferior Vena Cava which brings blood from the lower body to the heart. Notice that veins are colored blue. The reason for this is that the red blood cells are very low on oxygen, having delivered it to all the cells in the body. Blood in veins is very low on oxygen. The blood in the Vena Cava, being the last vein before the heart, has the lowest oxygen level of any vein. Blood flows from the Vena Cava into the Right Atrium.

PRESS

PULMONARY ARTERY - The Pulmonary Artery carries blood pumped by the Right Ventricle, to the lungs. Arteries are pipes (like veins) which carry blood away from the heart. Normally arteries are very rich in oxygen, having come from the heart and lungs. The Pulmonary Artery is the exception to this rule as it is the last blood vessel before the lungs. Blood in the Pulmonary artery has the lowest oxygen level of any blood in the body.

PRESS

LUNGS - Blood flows from the Pulmonary Artery into the Lungs. Before entering the lungs the blood is very low on oxygen and very high in carbon dioxide (a waste gas produced by the cells). In the lungs the blood releases its carbon dioxide to be exhaled by the lungs. The Red Blood Cells absorb oxygen in the lungs and then exit the lungs full of oxygen to be carried to all the cells of the body. (INTELLESTAR plans to intrduce a silmulation/game of the Respiratory/Excretory/Digestive systems in the fall of 1984 which will explore the lungs in greater detail.)

PRESS

PULMONARY VEIN - The Pulmonary Vein carries blood from the lungs to the heart. The Pulmonary Vein is the exception to the rule that veins contain blood which is low on oxygen. The most oxygen-rich blood in in the body flows through the Pulmonary Vein as it is the first to come from the lungs.

PRESS

LEFT ATRIUM - The Left Atrium receives blood from the Pulmonary Artery and pumps it into the Left Ventricle. As with the Right Atrium, the left atrium fills the Left Ventricle to the point of stretching.

PRESS

LEFT VENTRICLE - The Left Ventricle is the strongest and largest of the 4 heart pumps. It pumps blood throughout the entire body. By comparison the Right Ventricle is smaller than the left because the right ventricle need only pump blood through the lungs.

PRESS

MITRAL VALVE - The Mitral Valve stops blood from flowing back into the Left Atrium when the Left Ventricle pumps. When the Mitral Valve is not functioning, blood will flow backward in the Pulmonary Vein, towards the lungs.

PRESS

AORTIC VALVE - The Aortic Valve keeps blood from returning to the Left Ventricle after it has been pumped out. When the Aortic Valve is not functioning, you will notice the blood flowing backward into the Left Ventricle from the Aorta.

PRESS

VEIN VALVE - In the arteries, blood is kept flowing in the correct direction by the tremendous pumping action of the Right Ventricle, and by the fact that the blood is being squeezed into smaller and smaller arteries. As the blood flows into the veins, there is very litle power left from the Left Ventricle. The veins are full of many one-way valves to keep the blood flowing toward the heart. Without the vein valves the blood would flow back and forth in the veins.

PRESS

ORGANS ARTERIOLE - Opening the organs arteriole will direct blood to the inner core of the body and the organs. It will have the effect of raising Oxygen Level Indicators 1,2, and 3 and will also tend to raise body temperature. (See chart for indicator levels.)

PRESS

ORGAN/MUSCLE ARTERIOLE - Directs blood toward organs and muscle. Raises or maintains Oxygen Indicator 4 when open.

PRESS

MUSCLE/SKIN ARTERIOLE - Directs blood toward the muscle and skin. Raises or maintains oxygen level 4 when open.

PRESS

SKIN SURFACE ARTERIOLE - Directs blood to the skin surface. Raises oxygen level 5 and also lowers body temperature. As the blood moves through the skin surface, giving up heat to the air. When the skin surface and organ arterioles are both open or both closed, temperature will remain stable. When either arteriole is open without the other, temperature can be effected/controlled.

PRESS

CORONARY VEIN - The Coronary Vein (sometimes called the Coronary Sinus) carries oxygen depleted blood, (coming from nourishing the heart muscle cells), back into the Right Atrium.

PRESS

CORONARY ARTERY - The Coronary Artery branches off of the Aorta just as it leaves the heart. This blood vessel brings some of the most oxygen-rich blood in the body directly to the heart muscle cells. The Coronary Artery branches into capillaries, which eventually connect, becoming the Coronary Vein. The Coronary Artery and Coronary Vein keep the heart muscle well supplied with oxygen.

PRESS

VASOCONSTRICTOR NERVES - The veins are capable of stretching and relaxing. A set of nerves, called the Sympathetic Nerves, transmits electrical signals to the veins, causing them to lightly tighten and squeeze. This normal tension is called the "vasomotor tone" of the veins. When the Sympathetic Nerves send less signal to the veins, they relax and become reservoirs for excess blood. As they relax, blood is pulled from the circulation into our veins. At this time very few arterioles may remain open because there is little blood in the system to be directed to them. This relaxation of the veins is referred to as Vasodilation. It tends to lower oxygen and temperature levels. When the Sympathetic Nerves send greater than normal signals to the veins, they tighten greatly and contract, forcing great amounts of blood into the circulation. This will raise oxygen and temerature levels, while allowing many arterioles to be opened.

PRESS

SINO-ATRIAL (S. A.) NODE - The S.A. Node is a small part of the heart that beats at 72 beats per minute (bpm). As it beats, it produces an electrical signal which shocks the rest of the heart into beating 72 bpm. The S.A. Node is often referred to as the heart's pacemaker, as it controls the pace of the heart beat. When the S.A. Node is blocked, both the atrium and the ventricles slow down to about 60 beats per minute. (Note the effect on Heart Rate Indicators 1 and 2). This is the rate at which the atrium produces electrical signals which shock the atrium and ventricles into beating.

PRESS

ATRIOVENTRICULAR (A. V.) NODE - As the electrical shock wave spreads across the atrium of the heart, the shock wave passes over a bundle of nerve fiber called the A.V. Node. This causes a short delay in the signal, giving the ventricles time to fill. When the A.V. Node is functioning, the ventricles pump at the same rate as the atrium. When the A.V. Node is not functioning, the ventricles pump at their own natural rhythm of about 20 beats per minute (as indicated by Heart Rate 2).

PRESS

AORTA ARTERY - As discussed earlier, arteries are blood vessels which carry blood away from the heart. The biggest artery in the body is the Aorta. The Aorta branches into many smaller 'pipeline' arteries, which carry blood to every section of the body.

PRESS

ARTERIES TO CAPILLARIES - As the arteries move farther and farther from the heart, they branch-out in many directions. As the arteries divide they become smaller and smaller. They continue to branch until they reach microscopic levels.

PRESS

ARTERIAL CAPILLARIES - Capillaries are microscopic blood vessels. The grey area on your T.V. screen depicts a magnified view of the capillaries. It is in the capillaries that the red blood cells give up their oxygen to the body cells. Capillaries run near to every cell in our body, delivering oxygen and allowing the blood to absorb carbon dioxide for removal in the lungs.

PRESS

ARTERIOLES - There is not enough blood to go to every section of the body at one time. The Arterioles are microscopic Arterial Capillaries which open and close like gates and thereby direct blood to those areas of the body that need oxygen the most. The green area on your T.V. screen depicts greatly magnified arterioles with body cells next to them. The arterioles are very muscular tubes and usually are clamped shut. As the muscle of the arteriole runs low on oxygen, it weakens and opens up, allowing oxygen into the area it controls. When the arteriole's muscular cells have absorbed enough oxygen, it clamps down again, directing the blood flow elsewhere. The brain can also direct the arterioles to send blood to different parts of your body. For example, if you had to run from a dangerous situation, your brain would direct blood away from your stomach to your muscles so that your muscles would have plenty of oxygen for energy. On the other hand, if you were sitting down to relax after a big meal, the brain would direct blood to the digestive system, and away from the muscles. Although there are millions of arterioles in your body, only 4 are shown here.

PRESS

ARTERIAL CAPILLARIES - After the blood passes through the arterioles, it continues through more Arterial Capillaries.

PRESS

VENOUS CAPILLARIES - When the Arterial Capillaries have branched to their smallest size, they begin to reconnect, as blood begins to move back toward the heart. The Venous Capillaries, although microscopic, become larger and larger as they come together, directing the blood back toward the heart.

PRESS

CAPILLARIES TO VEINS - When the Venous Capillaries become big enough to be seen with the eye they become known as veins. The veins connect and collect, becoming larger as they return to the heart. The veins finally connect with the Vena Cava and bring the blood back to the heart to begin the trip again.

THE FOLLOWING PARTS of the Circulatory System are control mechanisms. Understanding their use is very important to game play. Keep the following section handy during initial game play as a reference. The control and effects of each part is described below. As each part is introduced, the White Blood Cell will be displayed above that part to help you locate it. Notice the location of the parts as they are introduced. Use the enclosed 'System Chart', and the following 'Operating Instructions' to refer to for diagnosis and correction of body problems.

PRESS

TRICUSPID VALVE - The heart contains a series of one-way 'doors' called valves. These allow the blood to flow in only one direction. The Tricuspid Valve is between the Right Atrium and the Right Ventricle. It prevents blood from being pumped back into the Atrium by the Ventricle. When this valve is not operating properly, you will see the blood in the Superior Vena Cava 'back-up' when the Right Ventricle pumps.

PRESS

PULMONARY VALVE - The Pulmonary Valve stops blood from flowing back into the Right Ventricle after it is pumped toward the Lungs. When the Pulmonary Valve is not functioning, you will notice the blood flowing backward from the Pulmonary Artery into the Right Ventricle.

WHITE BLOOD CELLS - Press the '1' key to change the cursor to a White Blood Cell. The cursor must be changed into a White Blood Cell before it can destroy germs. White Blood Cells destroy germs which invade the body. To destroy germs, use the arrow keys to move your white blood cell over a germ. Press the 'R' key to destroy the germ.

PLATELETS - Platelets are a type of blood cell used to stop bleeding. When Platelets are exposed to air (as they are when they rush out of a bleeding cut), they explode and form a sticky, spider-web-like material which closes the cut and allows new cells to form. If bleeding develops (as indicated by red breaks in the lower row of skin cells), change the cursor to a Platelet (use the 'C' key to signal cursor change then press '2' to indicate Platelet at the above cursor menu), move the Platelet to the cut and press the 'R' key. If your platelet is positioned properly, the cut will be healed.

NEURON - Press 'C' to indicate cursor change, then press '3' at the cursor menu to indicate Neuron. Next move the Neuron over any nerve, arteriole, valve, or the Coronary Artery or Vein to fix, or disrupt, the functioning of that mechanism. When the Neuron (a nerve cell) is in position, press the 'R' key to signal response. A tone will sound. An 'Uh-oh' sound indicates improper functioning. A 'Ta-da' sound indicates correct functioning.

Let's try a few experiments with our Neuron to discover the effects of some of the controller mechanisms.

EXPERIMENT 1: Control of Heart Rate.
Use your arrow keys to move your cursor over the S.A. Node (see chart for location of S.A. Node). If your cursor is not in the shape of a Neuron (see chart), press your 'C' key and then your '3' key. With your Neuron positioned over the S.A. Node, press the 'R' key until a tone sounds. You have just blocked the S.A. Node. It cannot send an electrical signal to the atrium. The Atrium slow down to their natural rhythm of 60 beats per minute. Indicator '1' measures heart rate of the atrium and will begin to show 60 beats per minute. The atrium produce an electrical signal which travel over the A.V. Node and stimulate the ventricles to beat at the same rate as the atrium (now 60 bpm). Note that oxygen levels remain fairly stable at 60 bpm. Now move your Neuron to the A.V. Node. When it is over the A.V. Node (see chart), press the 'R' key until a tone sounds. With the A.V. Node blocked, the ventricles do not receive an electrical signal from the atrium. The ventricles produce their own signal of about 20 bpm. With the A.V. Node blocked the ventricles beat at 20 bpm (Heart Rate Indicator 2), while the atrium continue to beat at 60 bpm (Heart Rate Indicator 1). This causes output and oxygen levels to drop sharply. Press the 'R' key to restore the A.V. Node to proper functioning. Heart Rate indicators should now both show 60 bpm (with the S.A. Node still blocked). Now move your Neuron over the Sympathetic Nerve (see chart). When you are in position, press the 'R' (Response) key until the tone sounds. Heart rate, temperature, and oxygen levels all increase. If bleeding was occuring, it would now occur at a faster rate. If the S.A.Node was not presently blocked, all indicators would increase even faster. Now press the 'R' (Response) key to restore the Sympathetic Nerves to normal functioning. Move to the S.A. Node and use the 'R' key to restore it to normal functioning. Heart rate should now move to 72 bpm. All indicators should now stabilize. The Parasympathetic Nerve will also effect heart rate, temperature, and oxygen levels.

EXPERIMENT 2: Arteriole control of blood supply, oxygen, and temperature levels.
Using the enclosed chart, move your Neuron to the 'Organ Arteriole'. Position your Neuron over the lower half of the Neuron. The 4 arterioles are very close together and your Neuron must be directly over the lower half of the arteriole you wish to control. This may require a bit of effort as you master use of the arrow keys. When the Neuron is in position over the 'Organ Arteriole', press the 'R' key and the arteriole will close. Oxygen indicators 1, 2, and 3 will drop as blood is diverted from the organs and the heart. Body temperature will also drop as blood flowing through the skins arterioles loses heat to the air. Press 'R' again to open the 'Organs Arteriole'. Now move to the 'Skin Surface Arteriole' (see chart). Press 'R' to close this arteriole. Oxygen level 5, measuring oxygen in the skin, will drop. Temperature will rise as blood is directed into the warmer body core and away from the skin surface. Next press the 'R' key to open the 'Skin Surface Arteriole'. Move to the 'Muscle/Skin Arteriole' and press 'R' to open it. After it opens, all arterioles should close down. There is not enough blood in the system to supply the needs of all arterioles (and the areas they supply with oxygen). Because of this, the system goes into 'shock' and all arterioles close. Reopen 3 arterioles; the 'Organs Areteriol', the 'Skin Surface Arteriole', and the 'Muscle/Skin Arteriole'.
The Vasoconstrictor Nerves determine the amount of blood in the system and available to the arterioles. With 3 of the arterioles restored, move to the Vasoconstrictor Nerves (see chart) and press 'R'. The following menu will appear:
1 VASODILATION
2 NORMAL VASOMOTOR TONE
3 VASOCONSTRICTION
Press the '3' key to indicate Vasoconstriction. This will cause the Vasoconstrictor Nerves to send greater than normal

PRESS

SYMPATHETIC NERVES - This set of nerves carries electrical signals to the heart and other parts of the circulatory system. The Sympathetic Nerves have many effects, characterized by increasing the activity of the heart and increased blood flow. Body temperature is also increased by the Sympathetic Nerves.

PRESS

PARASYMPATHETIC NERVES - The Parasympathetic Nerves tend to decrease the activity of the circulatory system, decrease blood flow and lower temperature.

PRESS

LEVEL CONTROL - Use your arrow keys to move your cursor, now a Neuron. If you moved the neuron over the Level Control Box and pressed the 'R' Key, the third part of this game would begin. DO NOT press the 'R' key. Pressing the 'R' key would increase the level from level '0' to level '1', beginning the game. Do not begin the game at this time. Instructions farther along in this documentation will direct you to starting the game.

PRESS

INDICATORS - At this point the title screen and indicators are displayed. The indicators are displayed on the right side of the screen and are described below as they appear from top to bottom.

OXYGEN LEVEL INDICATORS - The first 5 indicators measure oxygen levels. Keep these indicators from dropping into the blue range. Indicator '1' measures blood oxygen level in the right side of the heart. It can be lowered by valve damage, coronary damage, by closing the 'Organs Arteriole', or by slowing of the heart rate. Indicator '2' measures blood oxygen levels on the left side of the heart. It is effected by the same factors which effect Indicator '1', although in slightly different ways. Indicator '3' measures oxygen levles in the body organs, including the heart. It is effected most by the 'Organs Arteriole'. Indicator '4' measures blood flow to muscles, stomach and other areas. It is effected most by the 'Organ/Muscle Arteriole' and the 'Muscle/Skin Arteriole'. Indicator '5' measures oxygen levels in the blood which flows by the skin's surface. It can be effected most by the 'Skin Surface Arteriole'.

HEART RATE INDICATORS - The next indicators display Heart Rate in beats per minute (bpm). Heart Rate '1' is the rate of the atrium and is effected by the S.A. Node and by the Sympathetic and Parasympathetic Nerves. Heart Rate '2' is the rate of the ventricles. It is effected by the same things as Heart Rate '1' and is additionally effected by the A.V. Node.

BLOOD SUPPLY INDICATOR - Following Heart Rate is the Blood Supply Indicator. Blood is produced by the body but can fall to dangerously low levels if too much bleeding occurs. Bleeding is effected by the rate of blood flow and by the amount of constriction from the veins. Use Platelets to stop bleeding.

BODY TEMPERATURE INDICATOR - The next indicator displays Body Temperature. Try to keep this indicator in the middle of its graph. Temperature is effected by heart rate, constriction of the veins and by use of the 'Organs Arteriole' and the 'Skin Surface Arteriole'.

LITERS PER MINUTE - After temperature, the number of liters of blood pumped per minute is displayed. This is effected by heart Rates 1 and 2.

TOTAL LITERS OF BLOOD PUMPED - The final indicator tells how much blood has been pumped in total. The more blood pumped in a game, the better your understanding and control of the Circulatory System.

When the title screen is displayed, press any key to begin the second part of the program, The Heart Lab.

SECTION 2 - HEART LAB

NOTE ON KEYS: When pressing any keys in this game, you may need to press down for a second until it registers.
The 'C' key will change the shape of your cursor. The cursor can be used as a White Blood Cell, a Platelet, or a Neuron. The effect of each is further described below.
The 'R' key will cause your cursor to respond, having an efeect determined by the type of cell your cursor represents.
The Arrow keys (E,S,D,X) will move your cursor around the screen.
The Numbers 1, 2, and 3 are used at some game menus.

THE 'C' KEY - CURSOR CONTROL:
The cursor can be any of 3 shapes. If you press the 'C' key the screen will display:

1 WHITE BLOOD CELL
2 PLATELET
3 NEURON

electrical signals to the veins, causing them to contract and squeeze extra blood into the circulation. You could open all 4 arterioles at this time if you wished, without the danger of shock. Oxygen, temperature and bleeding levels will increase. Press 'R' again and the above menu will reappear. This time press '2' to return to normal vasomotor tone.

EXPERIMENT 3: Heart Valves and Coronary Vessels.
Move your cursor to the heart. Using the chart, locate the 4 heart valves and the vein valve. Position your cursor over one valve at a time. At each valve, press 'R' to block the valve. Notice the graphic differences as well as the effect on oxygen levels. Restore each valve by again pressing 'R' before moving to the next valve. Without carefull observation of blood flow, valve problems can be difficult to diagnose.
With all valves restored to normal functioning, move over the Coronary Artery and then the Coronary Vein (see chart). Disrupt one at a time and note the effect on oxygen levels. Restore the Coronaries before proceeding.

SECTION 3 - HEART ATTACK

The game 'HEART ATTACK' begins when you move your Neuron over the Level Control Box and press the 'R' key. The level indicator will move to '1' and the 'Total Liters Pumped' indicator will reset to '0'. As the game begins a combination of problems will keep the player busy diagnosing and repairing controls. The player will face a mixture of germ attacks and seizures.

GERM ATTACK - Germs coming from the lower part of the screen will occasionally attack the body, imbedding themselves in the skin. To destroy germs, move your cursor over the germ. If your cursor is NOT in the shape of a White Blood Cell (see chart), use the 'C' key and then the '1' key to change into a White Blood Cell. With your White Blood Cell in position over the germ, press the 'R' key to destroy the germ. If germs remain on the skin too long, they will penetrate the body. At this point the body will either begin to bleed or a control mechanism will malfunction. Occasionally a control mechanism will break down without a germ attack. This 'seizure' will cause the warning tone to sound.

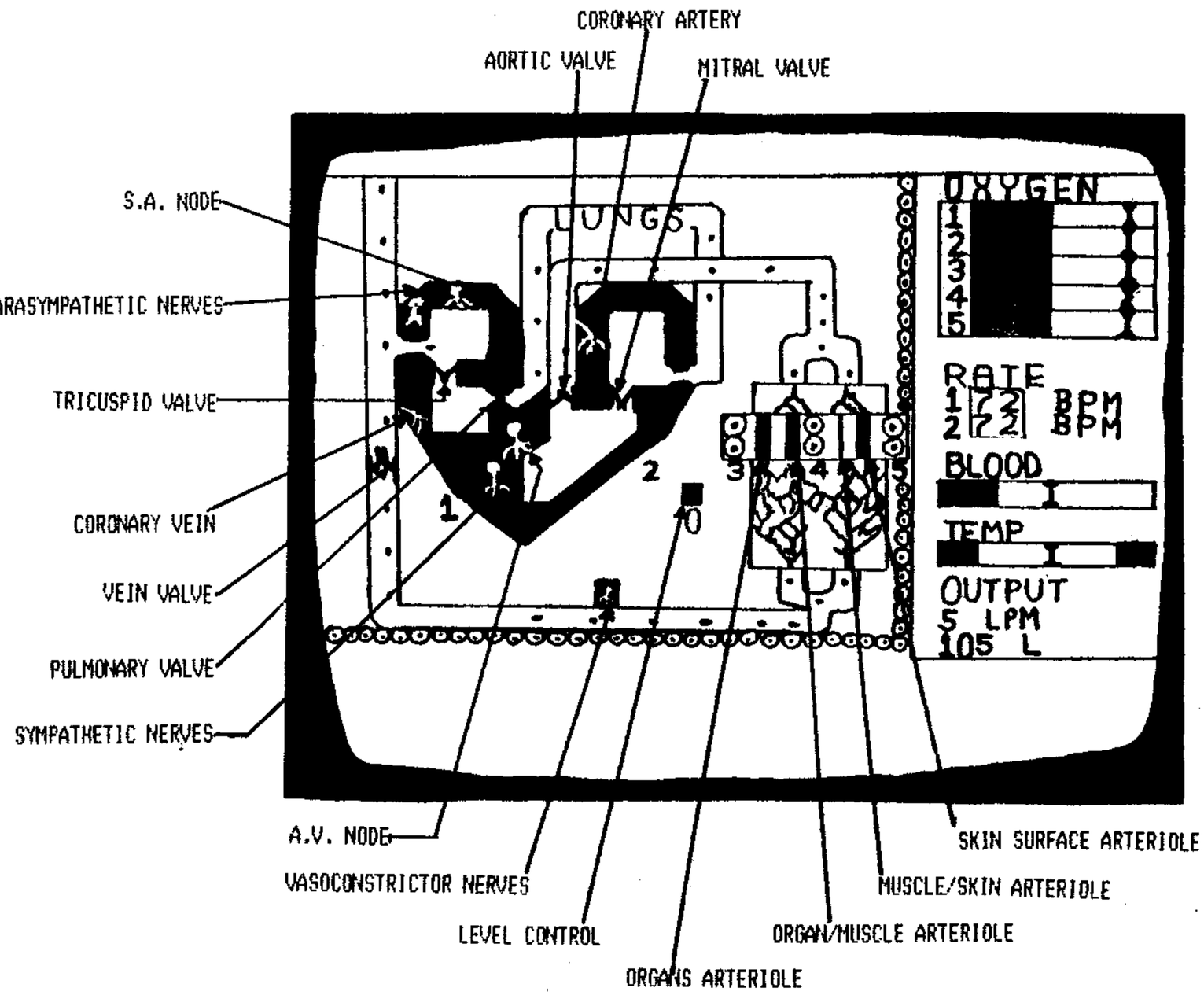
CONTROL OF BLEEDING - If bleeding occurs because of germ attack, a red area will replace a skin cell. Move your cursor to the cut. Press the 'C' key and then the '2' key to change the cursor to a Platelet. Press the 'R' key to cause the Platelet to explode, form a web-like structure and stop the bleeding (allowing skin cells to regrow over the cut). Increased heart rate and vasoconstriction will cause faster bleeding. Lowered heart rate and vasodilation will decrease bleeding.

REPAIR OF CONTROLS - If a control mechanism is destroyed by germ attack or seizure, change your cursor to a Neuron (use the 'C' key and then the '3' key). Move the Neuron over the suspected defective mechanism and press the 'R' key. An 'Uh-oh' sound will indicate that you have just broken a mechanism that was functioning normally. If this is the case, press 'R' again to restore normal functioning. When normal functioning is restored the 'Ta-da' sound will be played. You will need to refer to the second half of Section 2 of this documentation to help determine and correct defective controls.

GAME PLAY LEVELS - Levels 1-3 will provide occasional attack. Levels 4-6 will begin to provide a challenge. Levels 7-9 will cause eventual, unavoidable death. You may reset the level to level '0' at any time by counting past '9' with the Level Indicator. Score, measured by total liters of blood pumped, will reset with each level change. At level '0', you may stabilize the body before proceeding to the next round of 'HEART ATTACK'.

HEART ATTACK

CONTROL MECHANISMS OF THE CIRCULATORY SYSTEM



KEYS:
'R' TO CAUSE A RESPONSE TO YOUR CURSOR

'C' TO CHANGE THE TYPE OF CELL YOUR CURSOR REPRESENTS.

ARROW KEYS E, S, D, X
moves the cursor

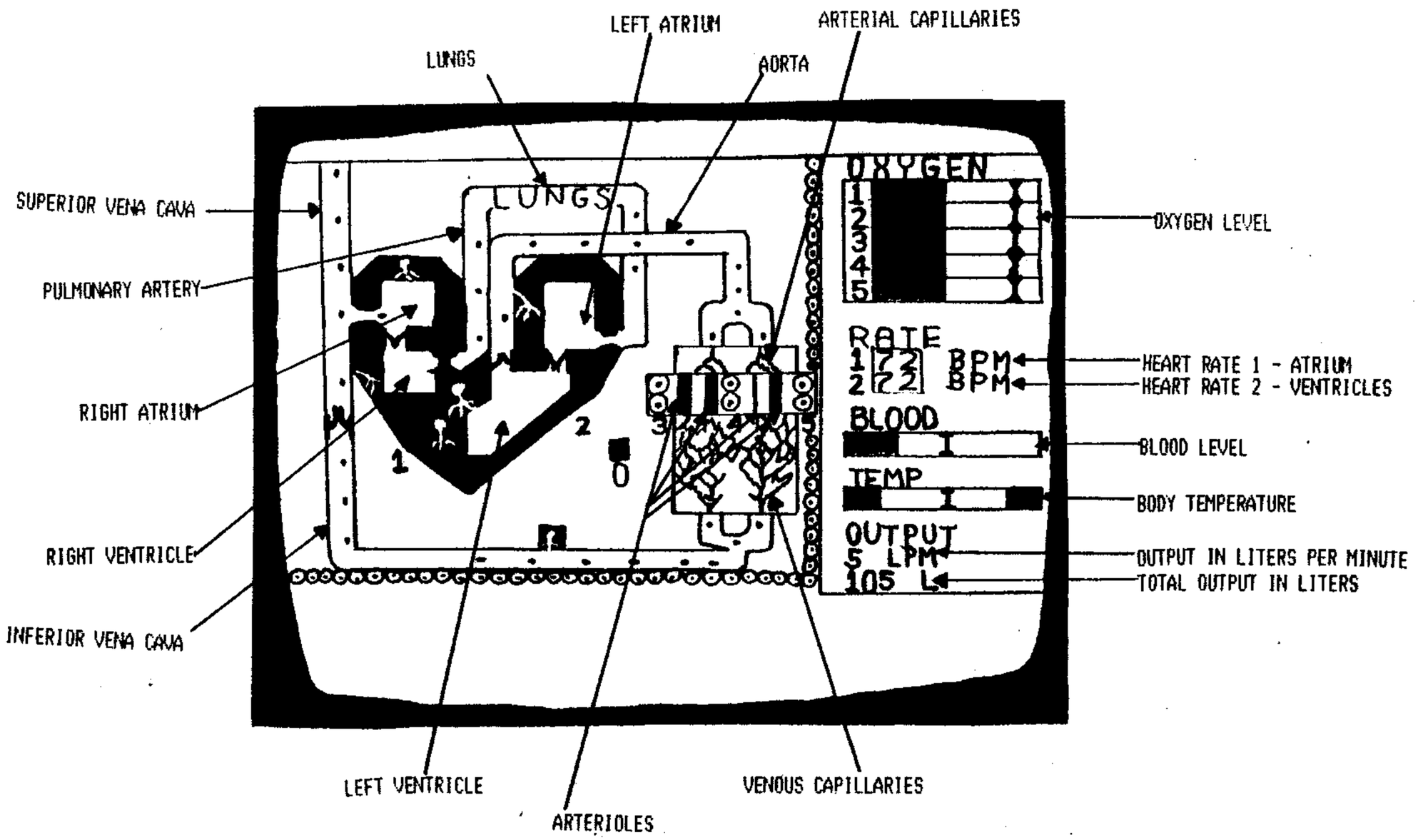
CURSORS

- WHITE BLOOD CELL - kills germs
- PLATELET - stops bleeding
- NEURON (nerve cell) - repairs or controls

NOTE: The parts labeled on this chart may vary in size, shape, and location from the real size, or shape, or location of these parts in the circulation.

H E A R T) A T T A C K

PARTS OF THE CIRCULATORY SYSTEM



NOTE: The parts labeled on this chart may vary in size, shape, and location from the real size, or shape, or location of these parts in the circulation.