The Heart

Choose all of the correct answers, and be prepared to explain your choice :

1. The cavity of the heart is divided …

a) into three layers
b) into two sides
c) into two halves
d) into two chambers
e) by a thick septum

2. The coronary arteries …

a) are part of the systemic circuit
b) are part of the pulmonary circuit
c) supply the myocardium with oxygen-rich blood
d) empty into the right atrium through the coronary sinus
e) are also known as "circumflex" arteries

3. The atrioventricular valves …

a) open at the end of systole
b) close at the end of systole
c) open when the ventricles contract
d) close when the ventricles contract
e) prevent the reflux of blood from the atria into the ventricles

4. Mitral regurgitation results in …

a) hypertension in the systemic circuit
b) hypertension in the pulmonary circuit
c) peripheral edema
d) heart attack
e) ventricular hypertrophy

5. The impulse to contract originates …

a) in the atria
b) in the ventricles
c) in the SA node
d) in the AV node
e) in the bundle of His

6. Ventricular systole … (p. 13)

a) is the longest phase in the cardiac cycle
b) is the shortest phase in the cardiac cycle
c) lasts from S1 to S2
d) lasts from S2 to S1
e) begins with the QRS complex and ends with the T wave

7. Stroke volume … (p. 16)

a) is higher for the left ventricle
b) is higher for the right ventricle
c) is always constant
d) is equal for both ventricles
e) can triple during exertion

8. The diagnosis of Acute Myocardial Infarction is confirmed by … (p. 19)

a) ST-elevation
b) systolic murmur
c) balloon angioplasty
d) cardiac markers
e) CXR

9. Thrombolytics should be given to patients with AMI … (p. 19)

a) if PCI is unavailable
b) in combination with balloon angioplasty
c) within 30 min. after the patient arrives at the ER
d) within 90 min. after the patient arrives at the ER
e) within 12 hours after the onset of symptoms

10. Typical symptoms of CHF include … (p. 20)

a) chest pain
b) edema
c) shortness of breath
d) fatigue
e) heartburn

VOCABULARY *in context*. Match the following definitions with words from the reading passage below, then give an appropriate translation in French.

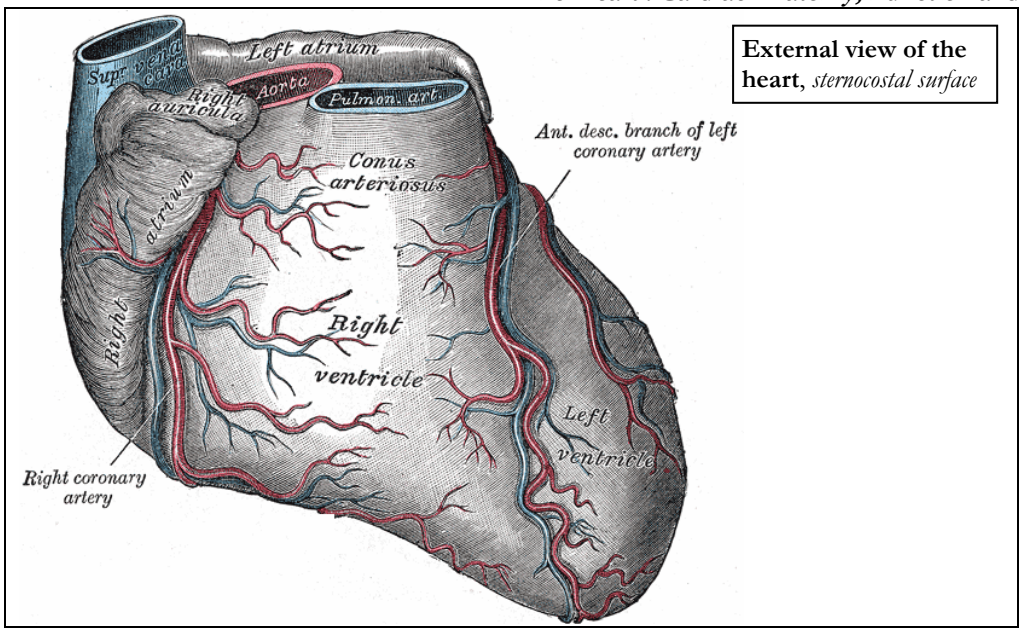
1. *The chambered, muscular organ that pumps blood received from the veins into the arteries, thereby maintaining the flow of blood through the entire circulatory system :* _____
2. *Having an empty space, or only air, within it; having a cavity inside; not solid :* _____
3. *Having the shape of :* _____
4. *A differentiated part of an organism, such as an eye etc. that performs a specific function :* _____
5. 1. Approximately, nearly; 2. In reference to; relating to; concerned with : _____
6. *The physical dimensions or proportions of an object :* _____
7. *A hand with the fingers closed tightly into the palm :* _____
8. *1. To determine the weight of sth. by or using a scale or balance. 2. To be of a specific weight (lb., kg. etc.) :* _____
9. Toward the back or rear; in reverse : _____
10. Located directly across (to the other side) from something else; Facing something else : _____
11. *The outermost line; perimeter, limit :* _____
12. *Relating to, or situated in or near the thorax :* _____
13. *The bones or cartilaginous segments forming the spinal column :* _____
14. *The point of culmination; The pointed end of an object :* _____

15. To the front; Located in advance : _____
16. From a higher to a lower place, point or level; descending : _____
17. *Positioned, situated; In a particular position :* _____
18. In a lower place; inferior to (in position) : _____
19. *Located (situated) between the ribs :* _____
20. *An imaginary line parallel to the long axis of the body and passing through the midpoint of the clavicle on the ventral surface of the body :* _____
21. *To picture (represent) in words; To convey (communicate) an idea of something, characterize; To arrange in some system, categorize :* _____
22. *Relating to both the sternum and the ribs :* _____
23. *Relating to the muscular partition separating the abdominal and thoracic cavities and functioning in respiration :* _____
24. *A tissue composed of fibers capable of contracting to effect bodily movement :* _____
25. *A structure within the body bounding, limiting or enclosing a space, cavity, chamber, or other anatomical unit. :* _____
26. *To be composed of :* _____
27. *A single thickness covering a surface; a stratum :* _____
28. *A thin membrane lining a closed body cavity and moistened with a fluid :* _____
29. *The membranous sac filled with serous fluid that encloses the heart and the roots of the aorta and other large blood vessels :* _____
30. *Located on the outside; external :* _____
31. *The exterior surface; envelope :* _____
32. *Central; intermediate :* _____
33. *The muscular tissue of the heart :* _____
34. In its most restricted sense; strictly so called : _____
35. *A cylindrical, multinucleate cell composed of numerous myofibrils that contracts when stimulated :* _____
36. *To cover the inner surface :* _____
37. In all parts; everywhere : _____
38. *The thin serous membrane, composed of endothelial tissue, that lines the interior of the heart :* _____
39. *A hollow area within the body :* _____
40. *To separate into parts :* _____
41. *Along the direction of the length, lengthwise :* _____
42. *Having relatively large diameter extent in relation to length; not thin :* _____
43. *A partition or membrane that divides two cavities or soft masses of tissue in an organism :* _____
44. *The part within an object to the left or right of the vertical axis :* _____
45. *An enclosed space in the body of an organism; a cavity :* _____
46. *Relating to the dorsal side of the body in human beings :* _____
47. *One of the upper chambers of the heart that receives blood from the veins and forces it into a ventricle, also called auricle :* _____
48. *The fluid consisting of plasma, erythrocytes, leukocytes and platelets that is circulated by the heart through the vascular system, carrying oxygen and nutrients to and waste materials away from all body tissues :* _____
49. *Any blood vessel that carries blood from some part of the body back toward the heart. (They have thin walls and often valves at intervals to prevent reflux of the blood which flows in a steady stream and is in most cases dark-colored due to the presence of reduced hemoglobin.) :* _____
50. *To bring together so as to increase in mass or number; accumulate :* _____
51. *Located on or near the front of an organ or on the ventral surface of the body in human beings :* _____
52. *One of the two lower chambers of the heart which receive blood from the atria and pump it into the arteries :* _____
53. *To cause a liquid to flow by suction or pressure :* _____
54. *One of the system of thick-walled blood vessels that carry blood away from the heart :* _____
55. In a higher position; superior in position : _____
56. *For the most part; chiefly; principally :* _____

Cardiac Anatomy[1]

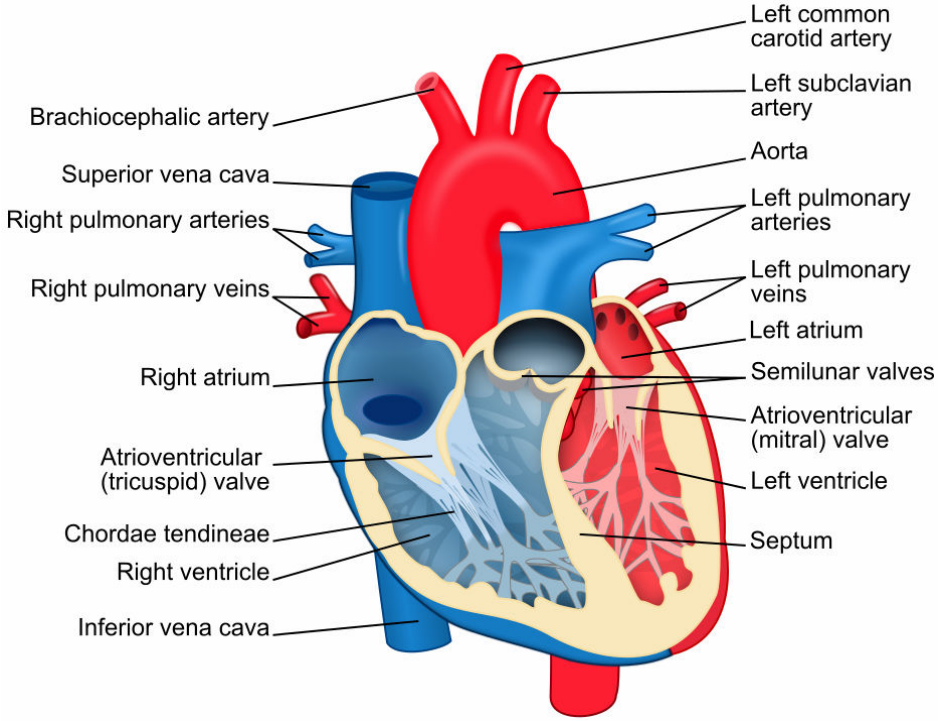
The heart is a hollow, cone-shaped organ. It* is about the size of a fist and weighs approximately 230g. The base of the heart, which* is directed backwards, lies opposite the borders of the 5th , 6th, 7th and 8th thoracic vertebrae. The apex is directed forwards, downwards, and to the left, and is located below the 5th left intercostal space in the mid-clavicular line. In addition to the base and the apex, three surfaces are usually described : the sterno-costal, the left and the diaphragmatic. The sterno-costal surface is limited by four borders, which* are sometimes referred to as the borders of the heart.

[1] Adapted from : *English in Basic Medical Science, Oxford University Press*



External view of the heart, *sternocostal surface*

The heart is essentially a hollow muscle. The wall of the heart is made up of three layers of tissue. A serous membrane, the pericardium, forms the outer covering of the heart. The middle layer, the myocardium, is the heart muscle proper. This* consists of specialized cardiac muscle fibres. Internally the heart is lined throughout with a serous membrane known as the endocardium.



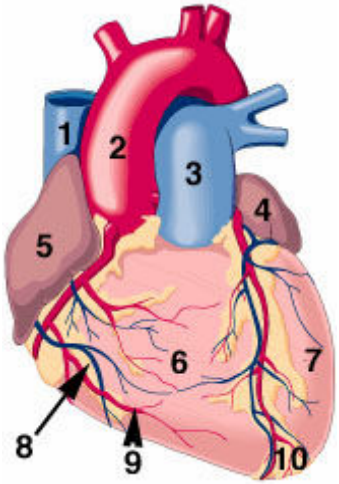
Internal view of the cavity of the heart

The cavity of the heart is divided longitudinally into two parts by a thick septum. Each side contains two chambers : a posterior chamber called the atrium, where the blood is received from the veins and collected, and a thickly[2] muscled anterior chamber called the ventricle, which* pumps the blood out again into the arteries. The atria lie above the ventricles. The base of the heart is formed mainly by the left atrium, and partly by the right atrium. The apex is formed entirely by the left ventricle.

[2] NB. mot à mot : *"le ventricule est plus épaissement musclé". Comme l'adverbe "épaissement" est rare, voire quasi inusité en français, on dira plus facilement que le ventricule est "musculairement plus épais" (moyennant une inversion de l'adjectif et de l'adverbe par rapport à l'anglais) ou qu'il est davantage "musclé en épaisseur" (avec une transformation de l'adverbe en préposition).*

Label the different points in the illustration below :

Aorta, Apex, Left Atrium, Left Ventricle, Pulmonary Arteries, Right Atrium, Right Coronary Artery, Right Coronary Vein, Right Ventricle, Superior Vena Cava



1. _____ **6.** _____

2. _____ **7.** _____

3. _____ **8.** _____

4. _____ **9.** _____

5. _____ **10.** _____

***What do the following words refer to ?**

a. "*It* is about the size*" → "It" refers to …
b. "*which* is directed backwards*" → "Which" refers to …
c. "*which* are sometimes referred to as the borders*" → "Which" refers to …
d. "*This* consists of specialized cardiac muscle fibres*" → "This" refers to …
e. "*which* pumps the blood out*" → "Which" refers to …

True or False ? (Be ready to explain and discuss).

i. The base of the heart is lower than the apex.
ii. Of the three surfaces of the heart, the sternocostal is the most commonly represented.
iii. The serous membrane of the heart is called the endocardium.
iv. The heart is asymmetrical.

Questions : (1) Ask questions about the following points, then (2) let someone else answer in a complete sentence (3) using as many of the suggested terms as possible.

WHERE –WHAT SORTS – HOW MANY (×2) – HOW – WHICH – WHY

1. *Position of* the heart within the chest. → …

opposite – column – while – apex – ribcage – left

The base of the heart…

2. *The composition of* the heart (tissue types) *The number of* layers of tissue *that* the heart contains. → …

essentially – made up – There are – membrane – outer – called – and – also known as – middle – or – " – proper" – consists

The heart, which …

3. *The internal structure/organization of* the heart cavity. → …

longitudinally – sides – separated by – Each side – which collects – and – pumps

Structurally, the heart cavity…

4. *The relative size of* the atria and ventricles. *The functional reason for this.* → …

larger – more – than – because – actively – blood into – whereas – from

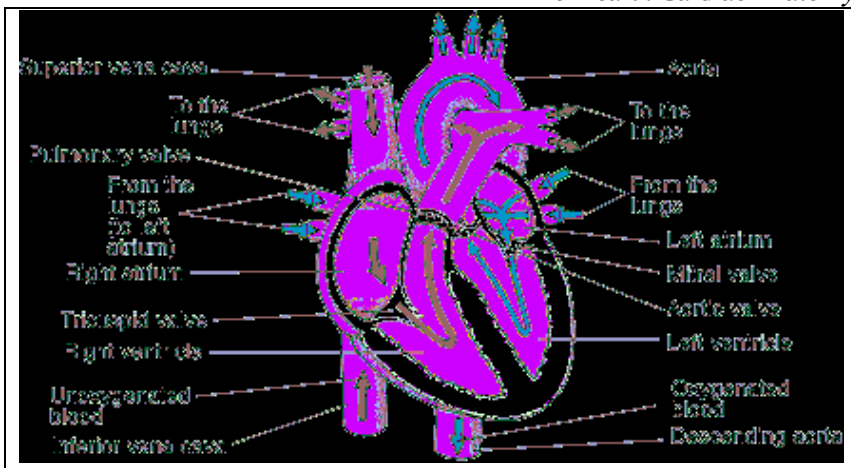
The ventricles, …

5. Make up one original question of your own relating to this section of the article, and write a 2-3 line answer to it using information either from the article or from outside sources.

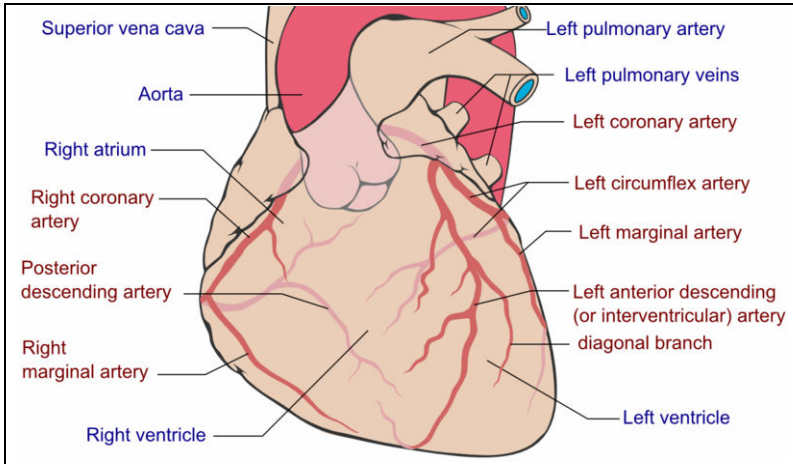
Circulation

VOCABULARY *in context*. Match the following definitions with words from the reading passage below, then give an appropriate translation in French.

57. In a circular progression or movement : _____
58. *A complete path or route which returns to the starting point; A system of vessels for the movement or passage of a liquid :* _____
59. *The passage of blood from the right atrium of the heart through the right ventricle and pulmonary arteries to the lungs where it is oxygenated and its return via the pulmonary veins to enter the left atrium :* _____
60. *The general circulation of the blood through the body, as opposed to the circulation of the blood from the heart to the lungs and back to the heart :* _____
61. *To move smoothly with unbroken continuity, as in the manner characteristic of a fluid :* _____
62. *A vein that is the second largest vein in the human body, is formed by the union of the two brachiocephalic veins at the level of the space between the first two ribs, and returns blood to the right atrium of the heart from the upper half of the body :* _____
63. *A vein that is the largest vein in the human body, is formed by the union of the two common iliac veins at the level of the fifth lumbar vertebra, and returns blood to the right atrium of the heart from bodily parts below the diaphragm :* _____
64. *Two large veins that drain blood from the upper body and from the lower body and empty into the right atrium of the heart :* _____
65. *A blood vessel that carries venous blood from the right ventricle of the heart to the lungs :* _____
66. *Two spongy, saclike respiratory organs, occupying the chest cavity together with the heart and functioning to remove carbon dioxide from the blood and provide it with oxygen :* _____
67. *To remove impurities; To make pure; purge or clean :* _____
68. *A colorless, odorless, incombustible gas, CO_2, formed during respiration :* _____
69. *To mix or supply with oxygen :* _____
70. *A blood vessel that carries oxygenated blood from the lungs to the left atrium of the heart :* _____
71. *The main trunk of the systemic arteries, carrying blood from the left side of the heart to the arteries of all limbs and organs except the lungs :* _____
72. *Two arteries that originate in the aorta and supply blood to the muscular tissue of the heart. :* _____
73. *The veins which return blood from the tissues of the heart and which open into the right atrium either directly or through the coronary sinus :* _____
74. To make or become empty, to discharge contents. : _____
75. *A venous sinus that opens into the right atrium of the heart and serves to drain the coronary veins.:* _____
76. The portion of an organ, that is buried in the tissues, or by which it arises from another structure : _____
77. To surround, cover, envelop, etc. as by folding or coiling : _____
78. To produce as a result. To bring about : _____
79. *The shortening and thickening of functioning muscle or muscle fiber :* _____
80. *To make sure or certain; guarantee :* _____
81. *To cause to move forward (with force) :* _____
82. *In accordance with fact, reason, etc.; correct, proper, or appropriate :* _____
83. To permit; To offer a possibility : _____
84. Easily, without difficulty, without restriction : _____
85. *To keep (stop) from happening; To present an obstacle :* _____
86. *A flat, usually thin piece attached at only one side; A projecting or hanging piece which protects or covers :* _____
87. To be attached from above with no support from below; To remain suspended : _____
88. *Containing all that is possible; Complete; At maximum capacity :* _____
89. Toward a higher place or position : _____
90. *To move (a door, for example) so that an opening or passage is covered or obstructed :* _____
91. *An opening, especially to a cavity or passage of the body :* _____
92. *The three-segmented valve of the heart that keeps blood in the right ventricle from flowing back into the right atrium :* _____
93. *A valve of the heart, composed of two triangular flaps, that is located between the left atrium and left ventricle and regulates blood flow between these chambers. Also called bicuspid valve :* _____
94. *Two valves, one located at the opening of the aorta and the other at the opening of the pulmonary artery, each consisting of three crescent-shaped cusps and serving to prevent blood from flowing back into the ventricles :* _____
95. Commonly called by this name : _____
96. The moon when only half its disk is illuminated. Something that is shaped like a crescent : _____
97. *The external appearance or structure of an object; form :* _____
98. A passage or way out : _____
99. *Flowing back; the return of a liquid in an opposite direction :* _____
100. *The pressure exerted by the blood against the walls of the blood vessels, especially the arteries :* _____
101. To be greater than; surpass : _____



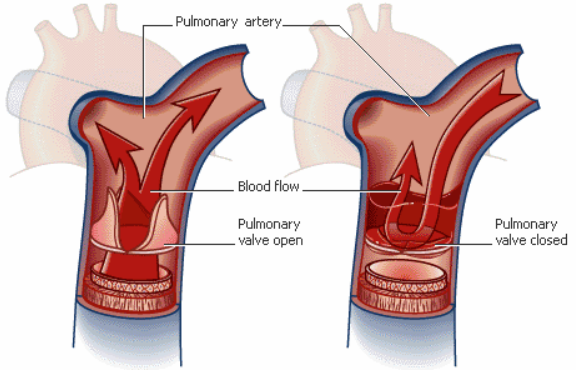
Direction of blood flow in the pulmonary and systemic circuits



Coronary circulation *is the circulation of blood in the blood vessels of the heart muscle (the myocardium). The vessels that deliver oxygen-rich blood to the myocardium are known as coronary arteries. The exact anatomy of the myocardial blood supply system varies from person to person. In general there are two main coronary arteries, the left coronary artery (LCA) and right coronary artery (RCA), although four percent of people also have a third, posterior coronary artery. Both of the two main coronary arteries originate from the beginning (root) of the aorta, immediately above the aortic valve and form several branches. The left circumflex artery (LCX) branches off from the left coronary artery and curves to the left around the heart to supply part of the left ventricle and papillary muscles. The left anterior descending artery (LAD), a.k.a. posterior interventricular artery, supplies the left ventricle, septum and apex. The posterior descending artery (PDA) is typically a branch of the right coronary artery and runs along the bottom of the left ventricle and septum toward the apex.*

The heart pumps blood round two circuits : the pulmonary and the systemic. Blood flows into the right atrium from the superior and inferior venae cavae. It* passes into the right ventricle, which* pumps it* out along the pulmonary artery to the lungs. There* it* is cleansed of carbon dioxide and re-oxygenated. It* returns along the pulmonary veins to the left atrium, passes into the left ventricle, and is pumped out into the aorta. Two main arteries, the left and right coronary arteries, arise from the root of the aorta and wrap around the heart to supply oxygen-rich blood to the myocardium. Deoxygenated blood returns from the myocardium through veins known as cardiac or coronary veins, most of which empty into the right atrium through the coronary sinus next to the inferior vena cava.

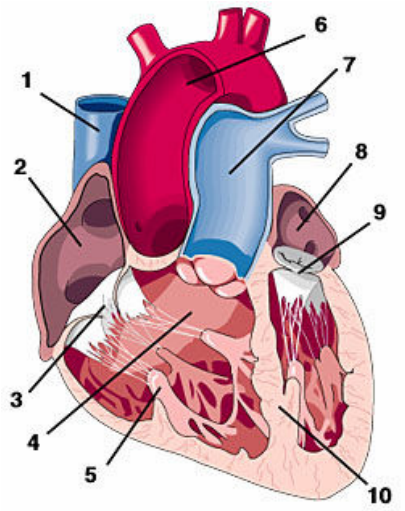
The pumping action of the heart is effected by rhythmic contraction of the muscle, and valves ensure that the blood is propelled in the right direction. The atria are separated from the ventricles by valves which allow the blood to pass freely from the atria into the ventricles, but prevent the blood from returning into the atria when the ventricles contract. These* valves are formed by flaps of endocardium which* hang down into the ventricles. When the ventricles are full of blood, the blood pushes the flaps upwards to close the orifice. The right atrio-ventricular orifice is closed by three flaps, known as the tricuspid valve. The mitral valve, which consists of two flaps, closes the left atrio-ventricular orifice. The semi-lunar valves, so called because of the half-moon shape of the flaps, lie at the exits of the ventricles, one* between the right ventricle and the pulmonary artery, and one* between the left ventricle and the aorta. These* valves too prevent the reflux of blood and help to maintain the pressure necessary for circulation. When the blood pressure in the arteries exceeds the blood pressure in the ventricles, the flaps of the semilunar valves close.



The arterial (semi-lunar) valves lie at the exits of the ventricles (pulmonary artery and aorta) to prevent the reflux of blood, and help maintain the pressure necessary for circulation.

The arterial (semi-lunar) valves

Inside the heart : *label the different points in the illustration below :* *Aorta, Left Atrium, Mitral (Bicuspid) Valve, Papillary Muscle*[3]*, Pulmonary Artery, Right Atrium, Right Ventricle, Septum,, Superior Vena Cava, Tricuspid Valve*



The heart (interior view)

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

***What do the following words refer to ?**

f. "*It* passes into the right ventricle, which pumps it* out*" → "It" refers to …
g. "*which* pumps*" → "Which" refers to …
h. "*There* it is cleansed* " → "There" refers to …
i. "*it* is cleansed of carbon dioxide… It* returns*" → "It" refers to …
j. "*These* valves are formed by flaps*" → "These valves" refers to …

k. "*which* hang down*" → "Which" refers to …
l. "*One between … and one between*" → "One" and "one" refer to …
m. "*These* valves too prevent the reflux*" → "These valves" refers to …

True or False ? (Be ready to explain and discuss).

v. The pulmonary arteries are unlike other arteries.
vi. An increase in blood pressure causes valves to open.

[3] NB. *small muscular columns attached at one end to the chordae tendineae and at the other to the wall of the ventricle that maintain tension on the chordae tendineae as the ventricle contracts*

vii. Special muscle fibers in the ventricles known as the "papillary muscles" contract to open and close the AV valves.
viii. After a contraction is finished, arterial pressure is higher than intraventricular pressure.
ix. *Valves in the arteries, known as arterial valves, help to maintain the pressure necessary for circulation.*

Questions : (1) Ask questions about the following points, then (2) let someone else answer in a complete sentence (3) using as many of the suggested terms as possible.

WHAT (×3) – WHICH – WHERE (×2) – WHAT + N – HOW

6. The pulmonary circuit → …

between – beginning with – which pumps – pulmonary artery – to – where – cleansed of – and – after which – to – along

The pulmonary circuit is the …

7. *The* chamber *that* receives blood from the pulmonary circuit. *The path (passage) of* blood after the lungs. → …

receive – from – along – vein – then – pass into – which – pump – out of – into

…

8. *The* vessels by *which* blood enters and leaves the chambers of the heart. → …

enter – by – leave – through – enter – right – by – superior – inferior – and – left – by – leave – right – by – artery – and – leave – left – by

Blood always…

9. *Location, structure & function of* the AV valves. *Similarities and differences between* the tricuspid and mitral valve (structure and position). → …

of three – endocardium – between – and – Likewise – between – left – and – in – orifice – Unlike – made up – only – Both valves – to allow – pass into – during – and close – from returning – into – during

On the right side,…

10. *The factor that* causes valves to close in the heart. → …

pressure – to close – for example – in the ventricles – push – flaps – atrioventricular – upwards – orifice – once – full – likewise – semilunar – close – when – arteries – exceed – ventricle

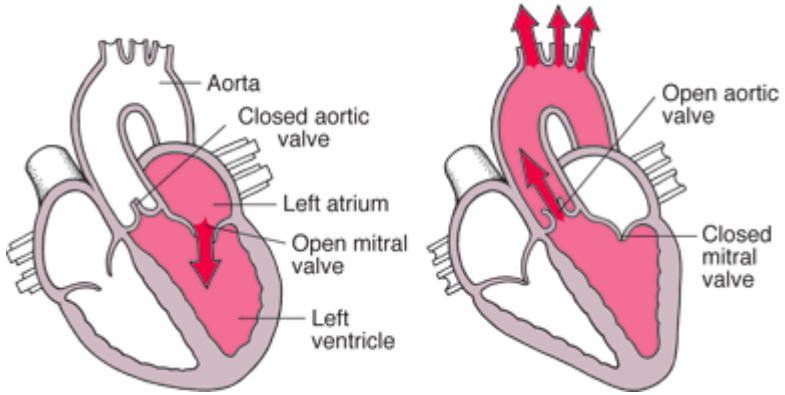
…

11. Make up one original question of your own relating to this section of the article, and write a 2-3 line answer to it using information either from the article or from outside sources.

Understanding Stenosis and Regurgitation

The heart valves can malfunction either by leaking (causing ***regurgitation****) or by not opening adequately and thus partially blocking the flow of blood through the valve (causing* ***stenosis****). Stenosis and regurgitation can affect any of the heart valves. These two disorders are shown below at the mitral valve.*

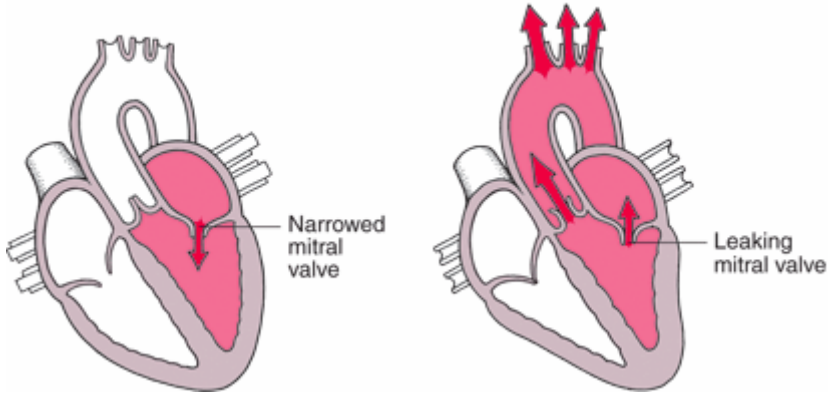
Normal Valve Mechanisms



Normally, just after the left ventricle finishes contracting and starts to relax and fill with blood again (during diastole), the aortic valve closes, the mitral valve opens, and some blood flows from the left atrium into the left ventricle. Then the left atrium contracts, ejecting more blood into the left ventricle.

As the left ventricle begins to contract (during systole), the mitral valve closes, the aortic valve opens, and blood is ejected into the aorta.

Mitral Stenosis **Mitral Regurgitation**



In mitral ***stenosis****, the mitral valve opening is narrowed, and blood flow from the left atrium into the left ventricle during diastole is reduced.*

In mitral ***regurgitation****, the mitral valve leaks when the left ventricle contracts (during systole), and some blood flows backward into the left atrium*

Cardiac Electrical Stimulation and Conduction

VOCABULARY *in context*. Match the following definitions with words from the reading passage below, then give an appropriate translation in French.

102. *The lengthening of inactive muscle or muscle fibers :* _____

103. *A single complete pulsation of the heart :* _____

104. *Of muscular origin; arising from the muscles :* _____

105. Id est (that is) : _____

106. *Existing as an essential constituent or characteristic; intrinsic, fundamental :* _____

107. Relying on or requiring support : _____

108. *The part of the nervous system which consists of the brain and spinal cord, to which sensory impulses are transmitted and from which motor impulses pass out, and which supervises and coordinates the activity of the entire nervous system. abbr CNS:* _____

109. Of diverse kinds; different. More than one; several : _____

110. A young chicken. The young of any bird : _____

111. *An organism in its early stages of development, especially before it has reached a distinctively recognizable form. The fertilized egg following cleavage. (In human beings, the prefetal stage from implantation through the eighth week of development) :* _____

112. *To remove by cutting. :* _____

113. *To pulsate; throb. To make rhythmic contractions, sounds, movements or vibrations :* _____

114. To discover with certainty, as through examination or experimentation : _____

115. *The 12 pairs of cranial nerves and 31 pairs of spinal nerves that originate in the brain and spinal cord. :* _____

116. *1. To supply (an organ or a body part) with nerves. 2. To stimulate (a nerve, muscle, or body part) :* _____

117. *The specialized striated muscle tissue of the heart :* _____

118. *An ionic crystalline compound. A chemical compound formed by replacing the hydrogen ions of an acid with metal ions or electropositive radicals. :* _____

119. 1. A tub for bathing, especially one installed in a bathroom. 2. A liquid in which something is immersed to maintain it at a constant temperature, to process it photographically, electrolytically, etc. : _____

120. *1. A quantity measured with respect to another measured quantity. A comparison between two quantities, a proportion 2. Speed or rhythm :* _____

121. *To regulate or command :* _____

122. *A small mass of specialized cardiac muscle fibers (made up of Purkinje fibers, ganglion cells, and nerve fibers) located in the posterior wall of the right atrium of the heart that acts as a pacemaker by generating at regular intervals the electric impulses of the heartbeat. also called S-A node, sinus node :* _____

123. *1. A part of the body, such as the mass of muscle fibers of the sinoatrial node, that sets the pace or rhythm of physiological activity. 2. Miniaturized and surgically implanted electronic devices used to stimulate or regulate contractions of the heart muscle :* _____

124. *Called correctly or specifically by a certain name. Also known as. :* _____

125. *A cluster (group) or strand (complex) of muscle or nerve fibers :* _____

126. *A slender (long and thin) bundle of modified cardiac muscle that passes from the atrioventricular node in the right atrium to the right and left ventricles by way of the septum and that maintains the normal sequence of the heartbeat by conducting the wave of excitation from the right atrium to the ventricles — also called atrioventricular bundle, His bundle :* _____

127. *The electrochemical transmission of a signal along a nerve fiber that produces a response at a target tissue, such as a muscle or another nerve (target = destination, objective) :* _____

128. To cause to happen, occur or exist : _____

129. *Modified cardiac muscle fibers, occurring as an interlaced network in the subendothelial tissue and constituting the terminal ramifications of the cardiac conducting system. :* _____

130. *Movement or variation characterized by regular recurrence or alternation :* _____

131. To cause to act in a specified manner : _____

132. To come or go after. To go in the (same) direction; be guided by. To take as a model or precedent; imitate : _____

The contraction and relaxation of the heart is called the heart beat. The heart beat is **myogenic**, i.e. it* is an inherent property of heart muscle, not dependent on the central nervous system. This* has been demonstrated in various ways.

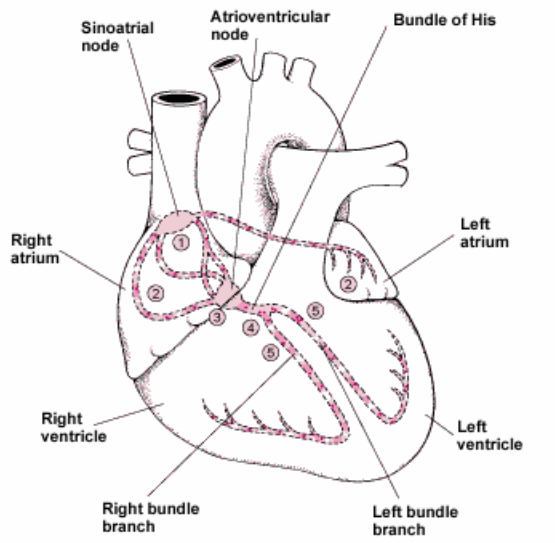
In his study of the chick embryo, Aristotle (384-322 B.C.) noted that the first manifestation of life was the pulsation of the heart, which* could thus be identified even before other organs were recognizable[4]. As early as the second century, Claudius Galen observed that an excised, denervated heart continued to beat after isolation. Since the end of the 19th century, thanks to Wilhelm His' embryological studies of the cardionervous system, it* has been ascertained that the heartbeat

[4] Cf. *Aristotle: Anatomy and Physiology*, Complete Dictionary of Scientific Biography, Gale 2008 http://www.encyclopedia.com/doc/1G2-2830900154.html

begins before the cerebrospinal nerves develop, i.e. before the heart is innervated.[5]

Moreover, if a cardiac muscle cell (cardiomyocyte) is immersed in a physiological saline (salt) bath, the muscle cell will contract and relax rhythmically with no external stimulation. If another cardiac cell is placed in the same bath it*, too, will beat at its* own separate rate. When the two cardiac cells are placed in contact, however, they* will both begin to beat as a unit.[6]

Certain parts of the myocardium have the special function of controlling heart action. A small collection of these specialized cardiac muscle fibres, known as the sinu-atrial node, is found in the wall of the right atrium, near the entrance of the venae cavae. The sinu-atrial node acts as a pacemaker, initiating the phase of contraction and controlling its* regularity. Another collection of specialized heart muscle, often referred to as the bundle of His[7], passes from the septal wall of the right atrium down the septum into both ventricles, transmitting to the ventricles the impulse from the atrium. The bundle branches give rise to thin filaments known as Purkinje fibers which distribute the impulse to the ventricular muscle. Thus* the rhythm of ventricular contraction is made to follow the rhythm of atrial contraction.



The sinoatrial node (1) initiates an electrical impulse that flows over the right and left atria (2), making them contract. When the electrical impulse reaches the atrioventricular node (3), it's delayed slightly. The impulse then travels down the bundle of His (4), which divides into the right bundle branch for the right ventricle (5) and the left bundle branch for the left ventricle (5). The impulse then spreads over the ventricles, making them contract.

***What do the following words refer to ?**

n. *"it* is an inherent property…"* → "It" refers to…
o. *"This* has been demonstrated…"* → "This" refers to …

p. *"which* could thus be identified even before other organs were recognizable"* → "Which" refers to …

q. *"it* has been ascertained"* → "It" refers to …

r. *"it*, too, will beat at its* own separate rate"* → "It" refers to…
s. *"they* will both begin to beat as a unit"* → "They" refers to …
t. *"controlling its regularity"* → "Its" refers to …
u. "*Thus* the rhythm of ventricular contraction is made to follow the rhythm of atrial contraction*" → "Thus" refers to …

True or False ? (Be ready to explain and discuss).

x. *The CNS has no effect on the heart beat.*
xi. *The impulse to contract is transmitted to the ventricles from the atria by the bundle of His.*

Questions : (1) Ask questions about the following points, then (2) let someone else answer in a complete sentence (3) using as many of the suggested terms as possible.

[5] Cf. *Why Does the Heart Beat?: The Discovery of the Electrical System of the Heart*, M. Silverman, D. Grove and Ch. Upshaw, Jr ; *Circulation* 2006 http://circ.ahajournals.org/cgi/content/full/113/23/2775
[6] Cf. *The property of inherent rhythmicity* http://www.tpub.com/content/armymedical/md0806/md08060046.htm
[7] NB. *His, Wilhelm (1863–1934), German physician. One of the first to recognize that the heartbeat originates in nodes of modified heart muscle. In 1893 he described the atrioventricular bundle.*

HOW LONG – WHAT – HOW (×2) – WHERE

12. *History of embryologic studies of the heart. Knowledge thus acquired.* → …

since Antiquity – and – begins – not only – organs – but even – nerves

Scientists …

13. *Means of demonstrating the independence* of the heartbeat. → …

entire – outside – cellular level – individual – rhythmically – without – which demonstrates – i.e – proper to – and not – system

Just as …

14. *Origin and transmission of* the impulse that controls the heart beat. → …

generated by – located – and – both – contract – Then – from – down – to – sequence – following

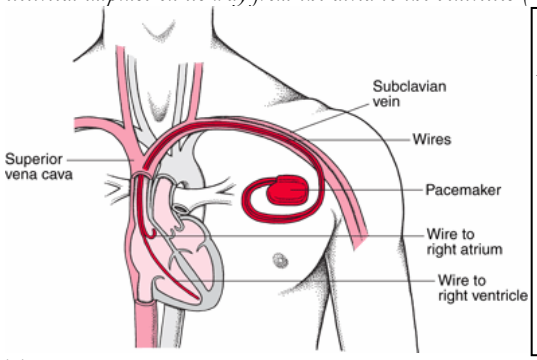
The impulse to…

15. Make up one original question of your own relating to this section of the article, and write a 2-3 line answer to it using information either from the article or from outside sources.

Cardiac arrhythmias[8] **–** *Cardiac arrhythmia is a term for any of a large and heterogeneous group of conditions in which there is abnormal electrical activity in the heart. The heart beat may be too fast or too slow, and may be regular or irregular.*

Bradycardia

A slow rhythm, (<60 bpm), is labelled bradycardia. This may be caused by a slowed signal from the sinus node (sinus bradycardia), a pause in the normal activity of the sinus node (sinus arrest), or by blocking of the electrical impulse on its way from the atria to the ventricles (AV block or heart block).



Artificial pacemakers – *Modern pacemakers usually have multiple functions. The most basic form monitors the heart's native electrical rhythm. When the pacemaker doesn't sense a heartbeat within a normal beat-to-beat time period, it will stimulate the ventricle of the heart with a short low voltage pulse. This sensing and stimulating activity continues on a beat by beat basis. The more complex forms include the ability to sense and/or stimulate both the atrial and ventricular chambers.*

Tachycardia

Any heart rate faster than 100 beats/minute is labelled tachycardia. Tachycardia may result in palpitation, however, tachycardia is not necessarily an arrhythmia. Increased heart rate is a normal response to physical exercise or emotional stress.

Fibrillation

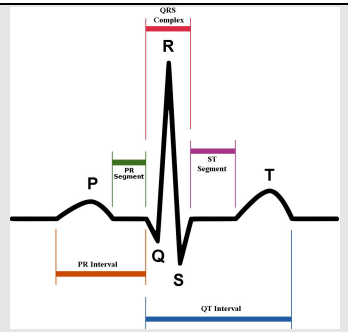
When an entire chamber of the heart is quivering with chaotic electrical impulses, it is said to be in fibrillation. Fibrillation can affect the atrium (atrial fibrillation) or the ventricle (ventricular fibrillation); ventricular fibrillation is imminently life-threatening. Atrial fibrillation may be due to serious underlying medical conditions, and should be evaluated by a physician. It is not typically a medical emergency. Ventricular fibrillation occurs in the ventricles (lower chambers) of the heart; it is always a medical emergency. If left untreated, ventricular fibrillation (VF, or V-fib) can lead to death within minutes. When a heart goes into V-fib, effective pumping of the blood stops. V-fib is considered a form of cardiac arrest, and an individual suffering from it will not survive unless cardiopulmonary resuscitation (CPR) and defibrillation are provided immediately. CPR can prolong the survival of the brain in the lack of a normal pulse, but defibrillation is the only intervention which can restore a healthy heart rhythm. Defibrillation is performed by applying an electric shock to the heart, which resets the cells, permitting a normal beat to re-establish itself.

[8] Sources : *http://en.wikipedia.org/wiki/Arrhythmia ; en.wikipedia.org/wiki/Artificial_pacemaker ; www.merck.com/mmhe/sec03/ch027/ch027a.html*

The Cardiac Cycle

VOCABULARY *in context*. Match the following definitions with words from the reading passage below, then give an appropriate translation in French.

133. To continue in time; go on : _____
134. Almost exact or correct : _____
135. *The normal rhythmical relaxation and dilatation of the heart chambers, especially the ventricles, during which they fill with blood :* _____
136. *To become full. To take in up to maximum capacity :* _____
137. *To increase (become greater) in size, volume or quantity; to dilate :* _____
138. *Existing or occurring before something else; earlier :* _____
139. *The rhythmic contraction of the heart, especially of the ventricles, by which blood is driven through the aorta and pulmonary artery after each dilation or diastole :* _____
140. *To serve as a medium for conveying; transmit, carry :* _____
141. *To move from a lower to a higher position; To increase in intensity :* _____
142. *To throw out forcefully; expel :* _____
143. *To become inactive and lengthen (a muscle or muscle fiber) :* _____
144. *To fall from a higher to a lower position. To become less in intensity :* _____
145. Close to the same number, time etc.; nearly : _____
146. Once more; one more time : _____



- **P wave** – *indicates that the* ***atria are electrically stimulated*** *to pump blood into the ventricles.*
- **QRS complex** – *indicates that the* ***ventricles are electrically stimulated*** *to pump blood out.*
- **ST segment** – *indicates the amount of time from the end of the contraction of the ventricles to the beginning of the T wave.*
- **T wave** – *indicates the* ***recovery period*** *of the ventricles.*

Schematic representation of normal ECG

A complete heart beat lasts approximately 0.8 second. For about 0.4 second the heart is relaxed. This* is known as the period of diastole. During the period of diastole, the atrio-ventricular valves are open[9] and the arterial valves are closed. The heart therefore fills with blood at the same time as it* expands from its* previous contraction. Blood flows into the two atria and through the open atrio-ventricular valves into the two ventricles. Then the period of systole begins. The atria both contract (P), forcing more blood into the ventricles. The phase of atrial systole lasts about 0.l second. The impulse to contract is conducted along the bundle of His to the ventricles (QRS) and the period of ventricular systole, lasting about 0.3 second, begins. When the ventricles begin to contract, the atrio-ventricular valves are closed by the upward movement of the blood. The ventricular pressure rises until it* is greater than the pressure in the aorta and the pulmonary artery. Then the arterial valves open and, as the contraction continues, blood is ejected from the ventricles into the arteries. At the end of the period of systole (T), the ventricles begin to relax, the ventricular pressure drops below the arterial pressure, and the arterial valves close. Almost immediately the ventricular pressure becomes less than the atrial pressure, the atrio-ventricular valves open, and the period of diastole begins again.

[9] NB. OPEN/CLOSE(D) – Pour choisir la forme qui convient, il faut distinguer 3 sens différents : 1/ l'événement, 2/ l'état, 3/ le passif (c'est-à-dire un changement imposé par un agent extérieur)

OPEN : 1/ TO OPEN Le verbe exprime un événement : "*Then the arterial valves open…*" ⇒ événement – à cet instant-là les valves s'ouvrent ; 2/ BE OPEN "*During the period of diastole, the atrio-ventricular valves are open*" ⇒ état – les valves sont ouvertes (pendant toute la période) ; 3/ BE OPENED BY "*be opened*" ne s'utilise que dans un sens passif "être ouvert par…" p.ex. *The aortic valve is opened by the increased pressure in the left ventricle during systole.*
CLOSE(D) : 1/ TO CLOSE Encore une fois, le verbe a un sens instantané : "*At the end of the period of systole … the ventricular pressure drops … and the arterial valves close*" ⇒ événement – À cet instant-là les valves se ferment. 2/ BE CLOSED "*During the period of diastole, … the arterial valves are closed*" ⇒ état – pendant toute la période les valves sont fermées ; 3/ BE CLOSED BY "*When the ventricles begin to contract, the atrio-ventricular valves are closed by the upward movement of the blood*" ⇒ sens passif – les valves sont fermées par le mouvement du sang. Contrairement à "*be open ≠ opened by*", on trouve la même forme "*closed*" aussi bien pour décrire un état que dans un sens passif (mais toujours suivi de BY dans ce dernier cas).

The cardiac cycle :

Diastole	0.4 sec.	• *The heart is relaxed* • *The A-V valves are open* • *The arterial valves are closed* • *The heart fills with blood and expands*
Atrial systole	0.1 sec.	• *Both atria contract* • *Blood is forced into the ventricles*
Ventricular systole	0.3 sec.	• *The impulse to contract is conducted along the bundle of His* • *The ventricles begin to contract.* • *The upward movement of blood causes the A-V valves to close* • *Ventricular pressure rises* • *The arterial valves open and blood is ejected into the aorta and pulmonary arteries* • *The ventricles relax and ventricular pressure drops* • *The arterial valves close and the A-V valves open (diastole begins again)*

***What do the following words refer to ?**

v. *"This* is known as the period of diastole"* → "This" refers to …
w. *"it* expands from its previous contraction"* → "It" and "its" refer to …
x. *"until it* is greater than the pressure in the aorta"* → "It" refers to …

True or False ? (Be ready to explain and discuss).

xii. In order for the arterial valves to open, the AV valves must close first.
xiii. There are two normal heart sounds made by valves when they open and close.
xiv. S1 is made by the tricuspid valve, and S2 is made by the mitral valve.
xv. S1 can be heard before diastole and S2 after diastole.

Questions : (1) Ask questions about the following points, then (2) let someone else answer in a complete sentence (3) using as many of the suggested terms as possible.

DOES – WHAT HAPPENS – WHEN (×2)

16. *Direction of* blood *flow* during diastole (enter/leave) → …

cannot – since – closed – Rather, – fills with – as – atria – and flows through – into

During the phase of …

17. *Steps (phases)* during the period of systole. → …

atrial – first – forcing more – into – Then – period of – systole – begins when – impulse to – from – to – along

During …

18. *Moment at which* the ATRIO-VENTRICULAR valves open and close. → …

during – when – relaxed – are closed by – upward – when – begin to – systole

The atrio-ventricular valves…

19. *Moment at which* the ARTERIAL valves open and close. → …

during – when – pressure – as a result of – greater than – in the … and the – close – at the end of – when – relax – and – drops below

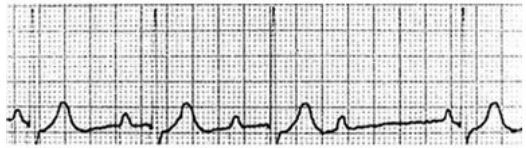
The arterial valves…

20. Make up one original question of your own relating to this section of the article, and write a 2-3 line answer to it using information either from the article or from outside sources.

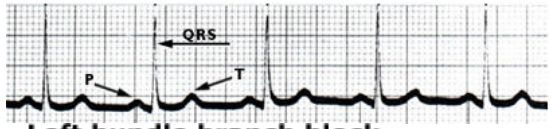
Heart Block[10] **–** *Heart block is a delay in the conduction of electrical current as it passes through the atrioventricular node, bundle of His, or both bundle branches, all of which are located between the atria and the ventricles.*

- *In* ***first-degree*** *heart block, electrical conduction to the ventricles is slightly delayed. Every electrical impulse from the atria reaches the ventricles, but each is slowed for a fraction of a second as it moves through the atrioventricular node. First-degree heart block is common among well-trained athletes, teenagers, young adults, and people with a highly active vagus nerve. This disorder produces no symptoms and can be detected only by electrocardiography (ECG), which shows the conduction delay.*
- *In* ***second-degree*** *heart block, only some electrical impulses reach the ventricles (conduction is intermittently blocked). The heart may beat slowly, irregularly, or both. Some forms of second-degree heart block progress to third-degree heart block.*
- *In* ***third-degree*** *heart block, no impulses from the atria reach the ventricles, and the ventricular rate and rhythm are controlled by the atrioventricular node, bundle of His, or the ventricles themselves. These are slower than the heart's normal pacemaker (sinoatrial node) and are often irregular and unreliable. Thus, the ventricles beat very slowly—less than 50 beats per minute. Third-degree heart block is a serious arrhythmia that can affect the heart's pumping ability. Fatigue, dizziness, and fainting are common.*

ECG: Heart Block

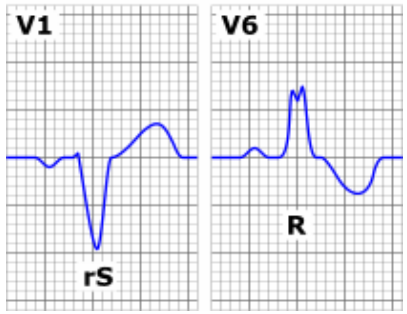


ECG: Normal Heartbeat



Heart Block *– An ECG strip shows the presence of heart block, in which conduction of the heartbeat from the atria (P) to the ventricles (QRST) is delayed. Heart block may be indicated by a delay in the spikes that progressively increases. A normal ECG strip is shown at the bottom for comparison*

Left bundle branch block characteristics



[11]

Bundle branch block *is a type of conduction block involving partial or complete interruption of the flow of electrical impulses through the right or left bundle branches. Bundle branch block can be detected by electrocardiography. Each type of block produces a characteristic pattern. Usually, no treatment is needed for either type. However, an artificial pacemaker may be implanted in people who are at high risk of complete heart block (such as people with certain types of second-degree heart block) to maintain the heart rate if complete heart block occurs.*

[10] http://www.merck.com/mmhe/sec03/ch027/ch027j.html
[11] http://www.merck.com/mmhe/sec03/ch027/ch027k.html

Cardiac Output

VOCABULARY *in context*. Match the following definitions with words from the reading passage below, then give an appropriate translation in French.

147.1. From then until now. 2. Because; due to the fact that : _____
148.Circulate through : _____
149.*1. Quantity. 2. A number; a sum. :* _____
150.*The capacity of a three-dimensional space expressed in cubic units :* _____
151.*The volume of blood pumped from a ventricle of the heart in one beat :* _____
152.*To range (cover or include different possibilities) within specified limits :* _____
153.*A strenuous (energetic) effort :* _____
154.Complete, total, entire : _____
155.To cause to go; transmit. To cause or force to move : _____
156.First in one direction and then in the opposite direction : _____
157.*Symbol Hg. A silvery-white poisonous metallic element, liquid at room temperature and used in thermometers, barometers, vapor lamps, and batteries. Atomic No. 80; Atomic wt. 200.59; Also called quicksilver :* _____
158.1. During the same time 2. Whereas (on the contrary) : _____
159.Even if. "It is true that [X] but [Y] is also true" : _____
160.*To make or become larger in number or amount (≠reduce):* _____
161.*The number of heartbeats per unit of time (usually per minute) :* _____
162.*The energy, power, or work produced by a system etc. :* _____
163.Up to a maximum of : _____
164.*To make shorter in length or duration. To reduce :* _____

Since all of the blood goes round both the pulmonary and the systemic circuits, the same amount of blood must be pumped out by each ventricle. The volume pumped out by one ventricle at a single beat (the stroke volume) varies from about 70 cc[12] at rest to about 200 cc during exertion. The left ventricle, which propels blood round the whole body, has to pump with much more force than the right ventricle, which sends blood only to the lungs and back. The left ventricle in fact pumps at a pressure of about 120 mm of mercury, while the right ventricle pumps at about 25 mm.

Although the stroke volume does increase during exertion, the volume of blood pumped out per minute is more significantly increased by a faster rate of heart beat. The normal heart rate, with each beat lasting about 0.8 second, is about 70 beats per minute. This* can be increased when necessary to about 200 beats per minute, with the result that cardiac output can vary from 5 litres per minute at rest to as much as 40 litres per minute. When the heart rate is increased, it is the diastolic phase in particular which is shortened.

***What do the following words refer to ?**
y. *"This can be increased"* → "This" refers to …

True or False ? (Be ready to explain and discuss).
xvi. The pressure in the systemic circuit is higher than in the pulmonary circuit.
xvii. An abnormally fast heart rate is known as bradycardia.

Questions : (1) Ask questions about the following points, then (2) let someone else answer in a complete sentence (3) using as many of the suggested terms as possible.

WHY – WHAT HAPPENS… TO

21. *The reason* the left ventricle pumps at a higher pressure than the right ventricle. → …

higher… than – because – pump out – the same …as – but over – longer – (the whole … or … circuit) – whereas – only to – (… circuit).

The left ventricle pumps…

22. *Events* during exertion *that* increase cardiac output. → …

stroke volume – from – to about – moreover – heart rate – from – to about – as a result – output – from – at rest – to

During exertion…

23. Make up one original question of your own relating to this section of the article, and write a 2-3 line answer to it using information either from the article or from outside sources.

[12] NB. *cc = cubic centimeter; mm = millimeter*

Heart Disease : Myocardial Infarction and CHF[13]

VOCABULARY *in context*. Match the following definitions with words from the reading passage below, then give an appropriate translation in French.

165. *Disease that affects the heart and blood vessels. : _____*

166. 1. To engage as a participant; embroil: involved the bystanders in his dispute with the police. 2. To influence or affect : _____

167. To confront : _____

168. *Progressively growing greater or larger : _____*

169. *1. The condition of being disabled ; incapacity. The period of such a condition ; 2. A disadvantage or deficiency, especially a physical or mental impairment that prevents or restricts normal achievement. Syn. handicap, cf. impairment : _____*

170. *Necrosis of a region of the myocardium caused by an interruption in the supply of blood to the heart, usually as a result of occlusion of a coronary artery. : _____*

171. *Sudden interruption or insufficiency of the supply of blood to the heart, typically resulting from occlusion or obstruction of a coronary artery and often characterized by severe chest pain. Also called myocardial infarction. : _____*

172. 1. To take place; come about. Syn. happen. 2. To be found to exist or appear : _____

173. *1. To make available for use; provide. 2. An amount of something available or sufficient for a given use : _____*

174. *A surface. A distinct part or section : _____*

175. *A thick, viscous, or coagulated mass or lump, as of blood. : _____*

176. To cease living; become dead. To cease (stop) all biological activity permanently : _____

177. *The fibrous tissue that replaces normal tissue destroyed by injury or disease. : _____*

178. *An abnormality in the rhythm of the heartbeat. : _____*

179. To cause to happen, occur or exist : _____

180. *An unpleasant sensation occurring as a consequence of injury, disease, or emotional disorder. Physical hurt or discomfort caused by injury or illness. : _____*

181. *To extend from a central point : _____*

182. *A feeling of difficult or labored breathing that is out of proportion to the patient's level of physical activity : _____*

183. *A feeling of sickness in the stomach characterized by an urge to vomit. : _____*

184. *Excretion of perspiration through the pores in the skin; perspiration. : _____*

185. A thick, pale-yellow, explosive liquid formed by treating glycerin with nitric and sulfuric acids. It is used to make dynamite and in medicine to dilate blood vessels. Chemical formula $C_3H_5N_3O_9$. : _____

186. A state of insensitivity to pain even though the person remains fully conscious, usually induced by a drug. : _____

187. A bitter crystalline alkaloid extracted from opium, the soluble salts of which are used in medicine as an analgesic, a light anesthetic, or a sedative. : _____

188. *To give or dispense medicine : _____*

189. *A record of the electrical activity of the heart showing certain waves called P, Q, R, S, and T waves. The Q, R, S, T waves are associated with contraction of the ventricles. : _____*

190. *1. An examination of a sample of blood to determine its chemical, physical, or serologic characteristics. 2. A serologic test for certain diseases. : _____*

191. *A substance in the blood whose level rises following a myocardial infarction. : _____*

192. *The restoration of blood flow to an organ or tissue that has had its blood supply cut off, as after a heart attack. : _____*

193. *A kind of drug that can break up clots blocking the flow of blood to the heart muscle : _____*

194. *The management of coronary artery occlusion by any of various catheter-based techniques, such as percutaneous transluminal coronary angioplasty, atherectomy, excimer laser angioplasty, and implantation of coronary stents and related devices. : _____*

195. *Damage, harm, or hurt, as from trauma. : _____*

196. *To accomplish, carry out, execute : _____*

197. *An x-ray of the arteries that supply blood to the heart : _____*

198. *A procedure in which a catheter equipped with a tiny balloon at the tip is inserted into an artery that has been narrowed by the accumulation of fatty deposits. The balloon is then inflated to clear the blockage and widen the artery. : _____*

199. *affected with or obstructed by a clot of coagulated blood : _____*

200. *A hollow, flexible tube inserted into a body cavity, duct, or vessel to allow the passage of fluids or distend a passageway. : _____*

201. To withdraw fluid by negative pressure, or suction. : _____

202. *Preceding; before : _____*

203. The purpose toward which an endeavor (action) is directed; an objective. : _____

204. 1. in or inside 2. before (a period of time) has passed : _____

205. *The section of a health care facility for providing rapid treatment to victims of sudden illness or trauma. : _____*

206. *A period during which something takes place or is projected to occur : _____*

[13] Sources : http://en.wikibooks.org/wiki/Human_Physiology/The_cardiovascular_system ; http://en.wikipedia.org/wiki/Heart_failure

207. *1. To cause to be later or slower than expected or desired ; 2. The time during which some action is awaited : _____*

208. A group organized to work together : _____

209. *The beginning or early stages (of a disease), the initial (first) appearance of symptoms. : _____*

210. The context and environment in which a situation is set : _____

211. The purpose toward which an endeavor (effort) is directed; an objective. : _____

212. *1. A small, slender implement used for sewing or surgical suturing, made usually of polished steel and having an eye at one end through which a length of thread is passed and held. 2. A hollow, slender, sharp-pointed instrument used for injection : _____*

213. To be more significant than; exceed in importance. : _____

214. *A condition in which the heart cannot pump enough blood to supply the body's tissues with sufficient oxygen and nutrients; back up of blood in vessels and the lungs causes buildup of fluid (congestion) in the tissues ; characterized by shortness of breath, weakness, and edema. : _____*

215. To be the outcome or consequence of : _____

216. *A physical condition in which there is a disturbance of normal functioning : _____*

217. *To damage or weaken in strength or quality : _____*

218. *The total number of cases of a disease in a given population at a specific time. In epidemiology, all the new and old cases of a disease or occurrence of an event during a particular period. : _____*

219. Deficiency or absence : _____

220. To achieve harmony of opinion, to consent ; to reach a joint decision about something : _____

221. 1. occurring or arriving before the correct or expected time 2. near the beginning : _____

222. Especially, mainly : _____

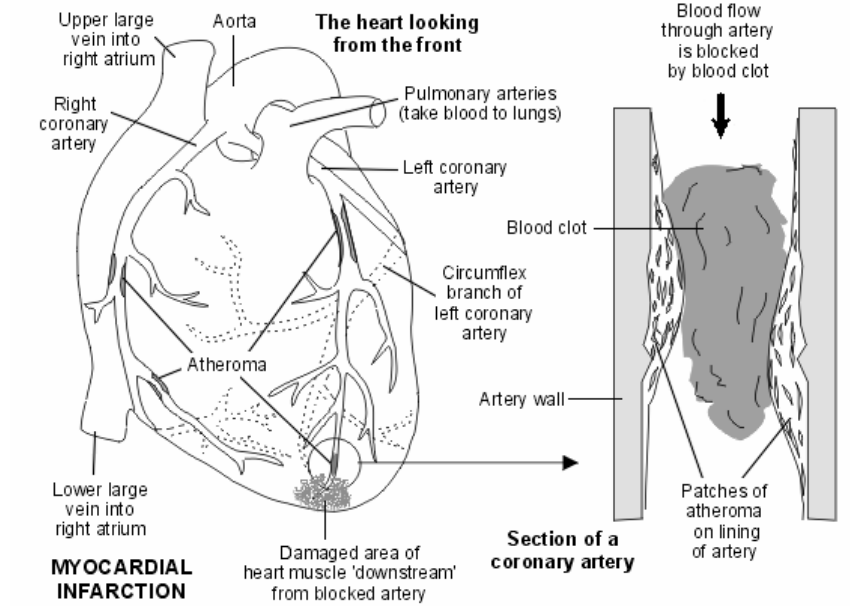
223. *An abnormal enlargement of a part of the body as the result of injury or infection : _____*

224. *To care or treat (but not necessarily cure) a disease : _____*

225. *Potentially mortal; extremely dangerous : _____*

Cardiovascular disease refers to diseases that involve the heart and/or blood vessels. Over 50 million Americans have cardiovascular problems, and most other Western countries face high and increasing rates of cardiovascular disease. It* is the number 1 cause of death and disability in the United States and most European countries.

Acute **myocardial infarction** (AMI or MI), commonly known as a heart attack, occurs when the supply of blood and oxygen to an area of heart muscle is blocked, usually by a clot in a coronary artery. If the blockage is not treated within a few hours, the affected* heart muscle will die and be replaced by scar tissue. Often, this blockage leads to arrhythmias (irregular heartbeat) that cause a severe decrease in the pumping function of the heart and may bring about sudden death.

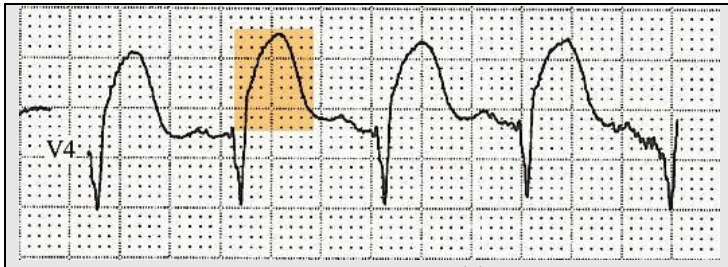


What happens when you have a myocardial infarction?[14] – *In MI, a coronary artery or one of its smaller branches is suddenly blocked. The common cause of an MI is a blood clot (thrombosis) that forms inside a coronary artery, or one of its branches. Blood clots do not usually form in normal arteries. However, a clot may form if there is some atheroma within the lining of the artery. If a 'crack' develops in the outer shell of the atheroma plaque, this exposes the softer inner core of the plaque to blood. This can trigger the clotting mechanism in the blood to form a blood clot. Therefore, a build up of atheroma is the root problem that leads to most cases of MI.*

Classical symptoms of MI include sudden chest pain (typically radiating to the left arm or left side of the neck), shortness of breath, nausea, vomiting, palpitations, sweating, and anxiety. Oxygen, aspirin, nitroglycerin and analgesia

[14] http://www.patient.co.uk/showdoc/23068792/

(usually morphine[15]) are administered as soon as possible. The patient will receive a number of diagnostic tests, such as an electrocardiogram (ECG or EKG), blood tests to detect elevations in cardiac markers[16][17], and a chest X-ray (CXR) to screen for alternative causes of chest pain and to identify possible contraindications to thrombolysis (e.g., aortic dissection)[18]. Once the diagnosis of myocardial infarction is confirmed, beta blockers and anticoagulation (heparin) are often given.



Electrocardiogram (detail) showing ST-segment elevation, *indicative of an anterior wall myocardial infarction. In the ED, the initial focus should be on identifying patients with STEMI. An ECG should be performed and shown to an experienced emergency medicine physician within 10 minutes of ED arrival. If STEMI is present, the choice between thrombolysis or primary PCI should be made within the next 10 minutes. The goal for patients with STEMI should be to achieve a door-to-drug time of within 30 minutes or a door-to-balloon time of within 90 minutes.*[19]

Reperfusion, i.e. restoration of blood flow to the heart muscle, either with thrombolytic therapy or percutaneous coronary intervention (PCI), has become central to the modern treatment of acute myocardial infarction. Because irreversible injury occurs within 2-4 hours of the infarction, there is a limited amount of time available for reperfusion to work. Primary PCI involves performing a coronary angiogram, followed by balloon angioplasty of the thrombosed arterial segment. An extraction catheter may also be used to aspirate the thrombus prior to balloon angioplasty. The goal of primary PCI is to open the artery as soon as possible, preferably within 90 minutes of the patient presenting to the emergency room. This* time frame is referred to as the "door-to-balloon" time. When performed rapidly, primary PCI restores blood flow to the artery in more than 95% of patients, however few hospitals can provide PCI within the 90-minute interval[20]. Treatment is often delayed by patient transport, emergency department delay, and preparation for catheterization. Furthermore, a skilled intervention team must be available 24 hours a day. If PCI is not available or will cause a delay greater than 90 minutes, the optimal approach is to administer thrombolytics (e.g. t-PA or streptokinase) within 12 hours of the onset of symptoms[21]. Thrombolytic therapy is more* universally available, can be administered by any properly trained health care provider, and can be given in the prehospital setting, reducing* the time to treatment. The goal is a door-to-needle time of less than 30 minutes. The effectiveness of thrombolytic therapy is highest within the first 2 hours after the onset of symptoms, after 12 hours, the risk associated with thrombolytic therapy outweighs any benefit.

[15] *Morphine is classically the preferred pain relief drug due to its ability to dilate blood vessels, which aids in blood flow to the heart as well as its pain relief properties. However, morphine can also cause hypotension, and should be avoided in the case of right ventricular infarction. Moreover, trials have also demonstrated an increase in mortality with administering morphine.*

[16] *Cardiac markers are proteins from cardiac tissue found in the blood. These proteins are released into the bloodstream when damage to the heart occurs, as in the case of a myocardial infarction. Since the 1980s, creatine kinase (CK) has been known to be specific for myocardial injury. Current guidelines are generally in favor of cardiac troponins, which are very specific for the heart muscle and are thought to rise before permanent injury develops. Note, however, that cardiac markers are not necessary for the diagnosis of patients who present with ischemic chest pain and diagnostic ECGs with ST-segment elevation. These patients may be candidates for thrombolytic therapy or primary angioplasty. Treatment should not be delayed to wait for cardiac marker results, especially since the sensitivity is low in the first 6 hours after symptom onset. ACC/AHA guidelines recommend immediate reperfusion therapy for qualifying patients with ST-segment elevation MI (STEMI), without waiting for cardiac marker results.* cf. http://emedicine.medscape.com/article/811905-overview

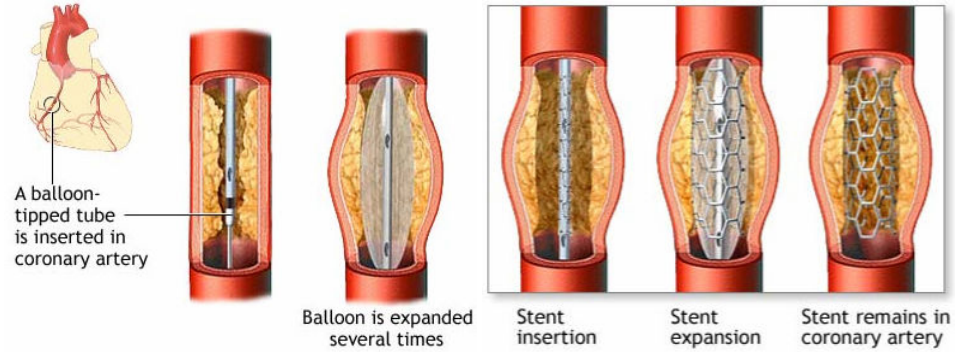
[17] http://emedicine.medscape.com/article/155919-workup#aw2aab6b5b2

[18] http://emedicine.medscape.com/article/155919-treatment

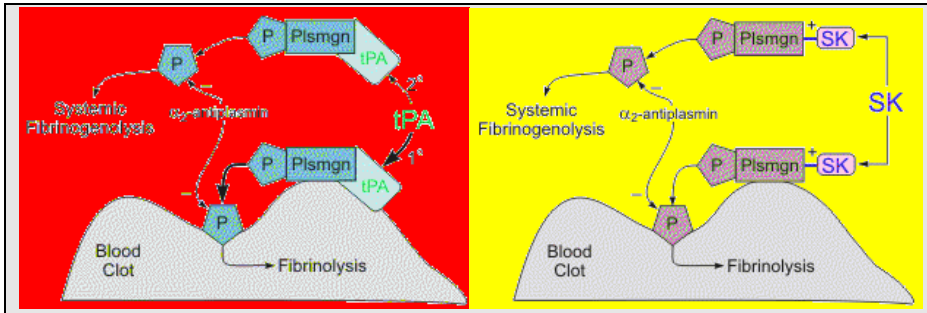
[19] http://emedicine.medscape.com/article/759321-treatment

[20] *In the United States, of the nearly 5,000 acute care hospitals, 2,200 have catheterization laboratories. Among those, only 1,200 (<25%) are capable of performing PCI. Observational registries demonstrate that less than 10% of patients who are transferred for primary PCI achieve a first door-to-balloon time less than 90 minutes.* http://emedicine.medscape.com/article/811234-overview *; cf. Jacobs AK. Regionalized care for patients with ST-elevation myocardial infarction, Circulation. March 2006;113(9):1159-61.; Chakrabarti A, Krumholz HM, Wang Y, et al. Time-to-reperfusion in patients undergoing interhospital transfer for primary percutaneous coronary intervention in the U.S: an analysis of 2005 and 2006 data from the National Cardiovascular Data Registry. J Am Coll Cardiol. June 2008;51(25):2442-3.*

[21] http://emedicine.medscape.com/article/155919-treatment



Coronary artery balloon angioplasty – *The coronary arteries can be narrowed or blocked when fat and cholesterol accumulate inside arteries (atherosclerosis). In balloon angioplasty a balloon-tipped tube is positioned so that the balloon part of the tube is beside the blockage. The balloon is then inflated for a few seconds to compress the blockage against the artery wall. Then the balloon is deflated. A metal scaffold known as a stent may then be placed within the coronary artery to keep the vessel open.*



Mechanisms of Thrombolysis[22]. *Thrombolytic drugs such as streptokinase and t-PA (tissue plasminogen activator) dissolve blood clots by activating plasminogen, which forms a cleaved product called plasmin. Plasmin is a proteolytic enzyme that is capable of breaking cross-links between fibrin molecules, which provide the structural integrity of blood clots.*

"Congestive" or chronic heart failure (CHF)[23] is a condition that can result from any structural or functional cardiac disorder that impairs the ability of the heart to fill with or pump a sufficient amount of blood, which then accumulates or "congests" in the lungs, veins or both[24]. The predominance of causes of heart failure is difficult to analyze due to differences in populations, and changing prevalence of causes with age. A 19-year study of 13000 healthy adults in the United States[25] found the following causes :

1. Ischemic Heart Disease 62%
2. Cigarette Smoking 16%
3. Hypertension (high blood pressure) 10%
4. Obesity 8%
5. Diabetes 3%
6. Valvular Heart Disease 2% (much higher in older populations)

Congestive heart failure is often undiagnosed due to a lack of a universally agreed on definition* and difficulties in diagnosis, particularly in early stages when the condition is considered "mild". Heart failure can cause a large variety of symptoms, chiefly shortness of breath and ankle swelling. With appropriate therapy (see Case History), heart failure can be managed in the majority of patients, but it* is a potentially life threatening condition.

***What do the following words refer to ?**

z. *"It* is the number 1 cause of death and disability"* → "It" refers to …
aa. *"the affected* heart muscle will die"* → The "affected" part is the part of the heart…

bb. *This* time frame is referred to as the "door-to-balloon" time.* → "This time frame" refers to the time between…
cc. *"Thrombolytic therapy is more* universally available"* → Thrombolytic therapy is more universally available than …
dd. *"reducing* the time to treatment"* → The time to treatment can be reduced by …

ee. *"due to a lack of a universally agreed on definition*"* → There is a lack of agreement between doctors about the definition of…
ff. *"but it* is a potentially life threatening condition"* → "It" refers to…

True or False ? (Be ready to explain and discuss).

xviii. In emergency treatment of STEMI, thrombolytic therapy is a faster alternative to PCI.
xix. In PCI, angiography is performed using a balloon to extract the thrombus from the clogged artery.
xx. MI and CAD are major causes of heart failure.
xxi. Shortness of breath is a sign of left-sided heart failure, whereas ankle swelling is a sign of right-sided heart failure.

[22] http://www.cvpharmacology.com/thrombolytic/thrombolytic.htm
[23] http://en.wikipedia.org/wiki/Heart_failure ; http://en.wikipedia.org/wiki/Heart_disease
[24] http://www.merck.com/mmhe/sec03/ch025/ch025a.html
[25] National Health and Nutrition Examination Survey (NHANES I)

Questions : (1) Ask questions about the following points, then (2) let someone else answer in a complete sentence (3) using as many of the suggested terms as possible.

HOW – WHAT (×2)

24. *Initial management of* patients presenting symptoms of acute MI. → …

such as – breath – radiating to – immediately – given – while – such as – and blood – diagnosis

Patients who present…

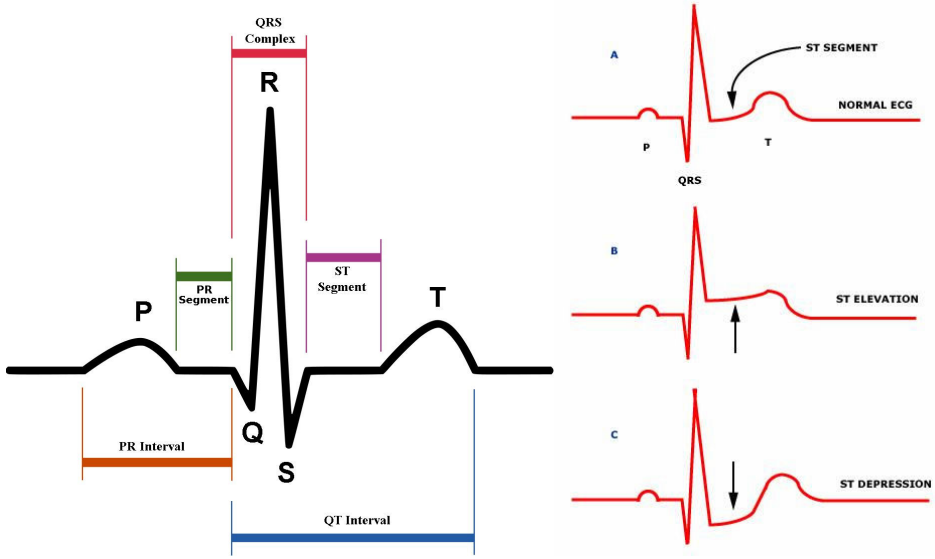
25. *Diagnostic* criteria for acute MI. *Treatment* strategies once the diagnosis of MI is confirmed. → …

confirmed – by – elevation – and/or – levels of – and – be initiated – either by – in order to – flow – before – irreversible

As soon as…

26. Make up one original question of your own relating to this section of the article, and write a 2-3 line answer to it using information either from the article or from outside sources.

1. 2. Chronic "art" failure : Jean Dubuffet (1901-1985) – *1. Court les rues, 1962 ; 2. Paysage avec personnage, 1980*



1. Schematic representation of normal ECG (left)[26] – *The electrical activity of the heart is measured by an electrocardiogram. By placing electrodes at specific locations on the body (chest, arms, and legs), a graphic representation, or tracing, of the electrical activity can be obtained.*

- **P wave** – *indicates that the* ***atria are electrically stimulated*** *to pump blood into the ventricles.*
- **QRS complex** – *indicates that the* ***ventricles are electrically stimulated*** *to pump blood out.*
- **ST segment** – *indicates the amount of time from the end of the contraction of the ventricles to the beginning of the T wave.*
- **T wave** – *indicates the* ***recovery*** *period of the ventricles.*[27]

2. STEMI (right)[28] **–***ST elevation myocardial infarction (STEMI) refers to an electrocardiographic pattern in which the ST segments are elevated reflecting complete epicardial vessel occlusion.*[29] *Given that the "T" wave represents the recovery period of the ventricular muscle after it has been stimulated, abnormalities of the ST segment and the T waves are often seen when the heart muscle is ischemic – that is, when it is not getting enough oxygen, usually because there is a blockage in a coronary artery.*[30] *One third of patients who experience ST Segment Elevation Myocardial Infarction will die within 24 hours of the onset of ischemia. Immediate treatment for suspected acute myocardial infarction includes oxygen, aspirin, nitroglycerin and pain relief, using an analgesic agent such as morphine sulfate.*[31]

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[26] http://en.wikipedia.org/wiki/Ecg
[27] http://www.healthsystem.virginia.edu/uvahealth/peds_cardiac/ekgecg.cfm
[28] http://www.uptodate.com/patients/content/topic.do;jsessionid=71F1DBAFF38C4323878589AF1AC403AE.1003?topicKey=~03f04xpnu/j8f
[29] http://www.wikidoc.org/index.php/ST_Elevation_Myocardial_Infarction_Overview
[30] http://heartdisease.about.com/cs/ekgecg/l/blecg1.htm
[31] http://www.wikidoc.org/index.php/ST_Elevation_Myocardial_Infarction_Overview

The Heart (CONTINUED)

VOCABULARY *in context*. Match the following definitions with words from the reading passage below, then give an appropriate translation in French.

226. *The inability of the heart to pump blood at an adequate rate, resulting in congestion in the lungs, shortness of breath, edema in the lower extremities, and enlargement of the liver. :* _____

227. Relating to, or designating a disease having no known cause. Relating to a disease that is not the result of any other disease. : _____

228. *Difficulty in breathing, often associated with lung or heart disease and resulting in shortness of breath. :* _____

229. *Moderate in type, degree, effect, Not extreme :* _____

230. *Pertaining to vigorous action or effort. :* _____

231. *The classic sign of venous hypertension (e.g. right-sided heart failure). in which the pulse is visualized at a level of the neck that is higher than normal. A clinical indicator of obstruction to the return of blood to the right atrium, e.g. because of congestive heart failure. :* _____

232. Relating to, or located at or near the base. : _____

233. *A discontinuous sound consisting of a series of short sounds, heard during inhalation. :* _____

234. *Any normal or abnormal sound heard by auscultation of the heart. :* _____

235. *An excessive accumulation of serous fluid in tissue spaces or a body cavity. :* _____

236. *A reference point used to indicate the initial condition against which future measurements are compared. :* _____

237. *The percentage of blood present in the left ventricle that is effectively pumped forward during systole to supply the peripheral circulation. :* _____

238. *A noninvasive diagnostic procedure that uses ultrasound to study to structure and motions of the heart. :* _____

239. *Relating to or affected by an inadequate supply of blood to a part of the body, caused by partial or total blockage of an artery. :* _____

240. *To remove from consideration; exclude (as a possibility). :* _____

241. *Easily perceived or understood; quite apparent. :* _____

242. A drug that increases the flow of urine (used in the treatment of high blood pressure, edema, etc.). : _____

243. A class of drugs that cause vasodilation by inactivating an enzyme that converts angiotensin I to the vasoconstrictor angiotensin II, used in the treatment of hypertension, congestive heart failure, and other cardiovascular disorders. : _____

244. *Medicine To cause reduction of (an inflammation, for example). :* _____

245. *A patient encounter with a health care provider in an office, clinic, or ambulatory care facility as an outpatient. :* _____

246. *To plan for a certain time or date. :* _____

247. *The process of monitoring the progress of a patient after a period of active treatment. :* _____

248. An abnormal condition in which the damaged heart maintains sufficient cardiac output by using normal compensatory mechanisms[32], symptoms are stable, and many overt features of fluid retention and pulmonary oedema are absent.[33] : _____

249. *Any liquid of the body. :* _____

250. A drug used in treating hypertension or arrhythmia; decreases force and rate of heart contractions by blocking beta-adrenergic receptors of the autonomic nervous system. : _____

251. A manner of living that reflects the person's values and attitudes. : _____

252. A state or condition at a particular time. : _____

253. *In a clinical examination, the collection of facts about the clinical signs of the patient, its environment including feeding, vaccination status, exposure to infection, recorded and arranged in chronological order and in relation to each other. :* _____

254. *Necrosis of a region of the myocardium caused by an interruption in the supply of blood to the heart, usually as a result of occlusion of a coronary artery, commonly known as a heart attack. :* _____

255. *The narrowing of an opening or passage-way in the body. :* _____

256. Nearer to a point of reference such as an origin, a point of attachment, or the midline of the body. : _____

257. An obstruction or closure of a body passage. : _____

258. *A sudden intense pain in the chest caused by a momentary lack of adequate blood supply to the heart muscle. :* _____

259. Characterized by or producing sound of great volume or intensity. : _____

260. Lasting throughout the systole of a heartbeat. : _____

261. *An abnormal sound of the heart; sometimes a sign of abnormal function of the heart valves. :* _____

262. *Blood flow in the wrong direction (from a ventricle to an atrium or into the heart from an artery) through a valve that has failed to close completely. :* _____

263. A small leaf or leaflike part. : _____

264. *To experience, endure, to live through :* _____

265. *A passage created surgically to divert the flow of blood to circumvent an obstructed anatomical pathway, such as in an artery. :* _____

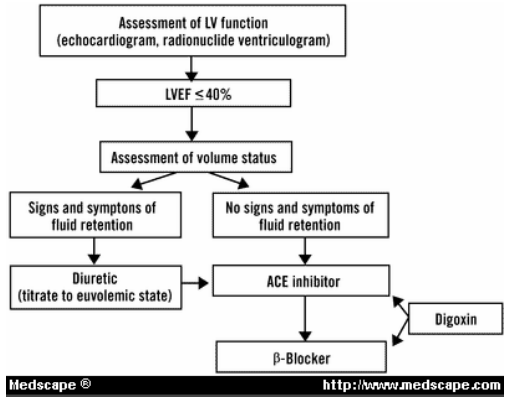
266. Surgical reconstruction of an incompetent cardiac valve. : _____

[32] http://www.pr.medtronic.com/Newsroom/LinkedItemDetails.do?itemId=1108502117982&itemType=glossary&lang=en_US

[33] http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1117602

Case History 1[34]

The patient was a 52-year-old man, "Steve", with newly diagnosed moderate heart failure caused by idiopathic dilated cardiomyopathy. He described being limited by dyspnea and fatigue with mild exertional activity (NYHA class III heart failure). When examined, he had jugular venous distention, a few bi-basilar pulmonary rales, a third heart sound (S3[35]), and mild peripheral edema. The patient's baseline left ventricular ejection fraction (LVEF) was 23%, as determined* by two-dimensional echocardiography. Blood pressure was approximately 115/70 mm Hg. Ischemic heart disease was ruled out; the patient had normal coronary arteries and no other obvious cause of heart failure.



Therapeutic goals for heart failure include not only alleviating symptoms and improving functional status and left ventricular function, but also slowing disease progression and reducing the patient's risk of worsening disability and death. Therapeutic intervention for this patient involved a two-pronged strategy : hemodynamic intervention, including diuretics, to provide symptomatic relief ; and neurohormonal intervention (ACE inhibitors and ß-adrenergic-receptor blockers) to impede disease progression.

Algorithm for the management of heart failure.[36]

Initial pharmacologic treatment consisted of a diuretic and an ACE inhibitor. After approximately 2 months, diuresis had resolved the patient's edema. At this* point, the patient had improved but remained mildly symptomatic* (NYHA class II). Office visits continued to be scheduled about every 2-3 weeks. When examined at a follow-up visit, there was compensated[37] heart failure with a blood pressure of 95/60 mm Hg and no signs* of fluid retention or low cardiac output.

NYHA Class	Symptoms
I	*No symptoms and no limitation in ordinary physical activity, e.g. shortness of breath when walking, climbing stairs etc.*
II	*Mild symptoms (mild shortness of breath and/or angina) and slight limitation during ordinary activity.*
III	*Marked limitation in activity due to symptoms, even during less-than-ordinary activity, e.g. walking short distances (20-100 m). Comfortable only at rest.*
IV	*Severe limitations. Experiences symptoms even while at rest. Mostly bedbound patients.*

The New York Heart Association (NYHA) Functional Classification – *The New York Heart Association (NYHA) Functional Classification provides a simple way of classifying the extent of heart failure. It places patients in one of four categories based on how much they are limited during physical activity; the limitations/symptoms are in regards to normal breathing and varying degrees in shortness of breath and or angina pain.*

A ß-blocker[38] (Carvedilol) was started. Six months later, Steve had returned to a fully active lifestyle, with an LVEF of 38% and a heart failure status of NYHA class I (asymptomatic).

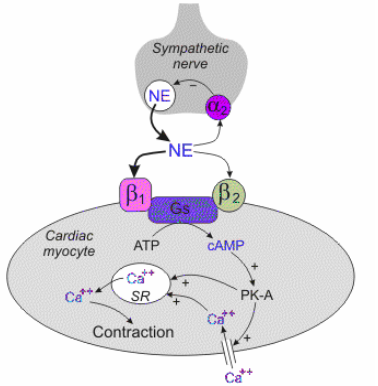
[34] Adapted from : http://www.medscape.com/viewarticle/431753_5

[35] *The third heart sound or S3 is a rare extra heart sound that occurs soon after the normal two "lub-dub" heart sounds (S1 and S2). It occurs at the beginning of diastole immediately after S2. It has also been termed a ventricular gallop or a protodiastolic gallop because of its place in early diastole. S3 is thought to be caused by the oscillation of blood back and forth between the walls of the ventricles initiated by inrushing blood from the atria. It may also be a result of tensing of the chordae tendineae during rapid filling and expansion of the ventricle.*

[36] *From : Packer M, Cohn JN. Consensus recommendations for the management of chronic heart failure. Am J Cardiol 1999;83:1A-38A. ACE = angiotensin-converting enzyme; LV = left ventricular; LVEF = left ventricular ejection fraction.*

[37] *In the case of heart failure, several types of* ***compensation*** *are possible. First, the heart chambers may enlarge, and the heart may beat more forcefully to pump out more blood for the body's needs. In time, the overworked heart muscle enlarges, creating increased muscle fibers with which the heart can pump more forcefully. Second, the heart may be stimulated to pump more often, thereby increasing its output. Third, a compensation mechanism called the renin-angiotensin system may be initiated. When the lack of blood volume coming from the heart (cardiac output) results in a decrease in the amount passing through the kidneys, the kidneys respond by stimulating the system to secrete hormones that prompt the kidneys to retain salt and water, and thereby increase blood volume.* – http://www.med.yale.edu/library/heartbk/14.pdf

[38] *ß-Blockers were formerly considered to be contraindicated in heart failure therapy because they depressed left ventricular function. Despite this short-term effect, it is now evident that long-term ß-adrenergic blockade reduces damage to heart and blood vessels caused by prolonged activation of the sympathetic nervous system in heart failure.* – http://www.medscape.com/viewarticle/431753_8



Abbreviations: NE, norepinephrine; Gs, G-stimulatory protein; PK-A, cAMP-dependent protein kinase; SR, sarcoplasmic reticulum

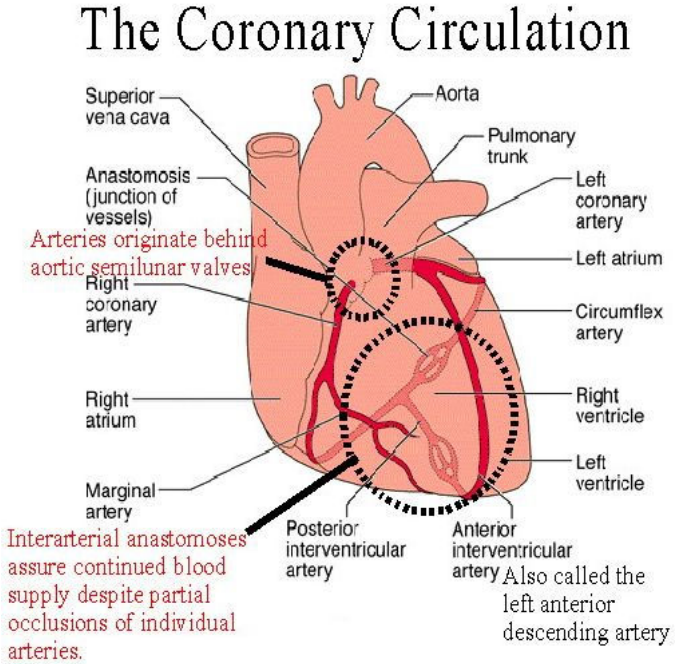
39

Beta-blockers – *Beta-blockers bind to beta-adrenoceptors located in cardiac nodal tissue, the conducting system, and contracting myocytes. Beta-blockers prevent the normal ligand (norepinephrine or epinephrine) from binding to the beta-adrenoceptor by competing for the binding site. Beta-blockers are able to reduce sympathetic influences that normally stimulate chronotropy (heart rate), inotropy (contractility), dromotropy (electrical conduction) and lusitropy (relaxation). Therefore, beta-blockers cause decreases in heart rate, contractility, conduction velocity, and relaxation rate. These drugs have an even greater effect when there is elevated sympathetic activity.*

Case History 2[40]

A 76-year-old male, Robert, presents with a history of inferior myocardial infarction. Coronary angiography shows 3-vessel disease (90% stenosis of the mid left anterior descending artery, proximal occlusion of the dominant right coronary artery, and 80% stenosis of the circumflex artery). The patient complains of dyspnea and angina. His blood pressure is 150/95 mm Hg. A loud holo-systolic murmur is heard over the apex. Echocardiography reveals severe mitral regurgitation due to a restricted posterior mitral valve leaflet[41].

The patient underwent successful coronary artery bypass surgery and mitral annuloplasty.



Coronary circulation (coronary arteries)– *The coronary arteries leave the aorta behind the semilunar valves. This means that they fill during ventricular diastole. The right coronary artery branches to smaller arteries including the marginal, which leads down the margin or edge of the right ventricle. The main portion of the right coronary artery proceeds to the back of the heart becoming the posterior interventricular. The left coronary artery divides to form the circumflex which curves to the back of the heart, and the anterior inter-ventricular which descends between the two ventricles. The arteries anastomose to provide collateral circulation to the ventricular myocardium.*[42]

***What do the following words refer to ?**

gg. *"as determined* by two-dimensional echocardiography"* → Echocardiography was used in order to determine…

hh. *"At this* point, the patient had improved"* → "This point" refers to …

ii. *"the patient had improved but remained mildly symptomatic*"* → The patient continued to experience symptoms such as…

jj. *"and no signs* of fluid retention or low cardiac output"* → Signs of fluid retention and low cardiac output include…

[39] http://www.cvpharmacology.com/cardioinhibitory/beta-blockers.htm

[40] http://www.medscape.com/viewarticle/405317

[41] *Changes in ventricular geometry following myocardial infarction can lead to apical displacement of the papillary muscle. This causes tethering of the mitral valve leaflets and impairment of mitral valve closure. This mechanism of mitral regurgitation is also called "restricted leaflet motion" and is more common in inferior/posterior infarcts. In such cases, the posterolateral papillary muscle and the posterior leaflet are involved. The presence of severe mitral regurgitation after myocardial infarction is an important complication, which adversely affects the prognosis of patients.* – http://www.medscape.com/viewarticle/405317_2

[42] http://webanatomy.net/anatomy/circulatory_notes.htm

True or False ? (Be ready to explain and discuss).

xxii. In heart failure, high blood pressure causes fluid to leave blood vessels and enter tissues, causing edema.

xxiii. Beta-blockers are prescribed in order to stimulate the heart to beat harder, thereby increasing cardiac output.

Questions : (1) Ask questions about the following points, then (2) let someone else answer in a complete sentence (3) using as many of the suggested terms as possible.

WHY –WHAT (×2)

27. *The reason* Steve's heart failure was described as "idiopathic". → …

obvious – such as – pressure – or – artery – detected – described as – in other words – not – other

Given that no…

28. Strategy *involved in* Steve's initial and long-term drug therapy. → …

to relieve – due to – retention – whereas – inhibitors – to lower – pressure – from – to – mm Hg – resistance – thereby – pumping action – Finally, – prevent

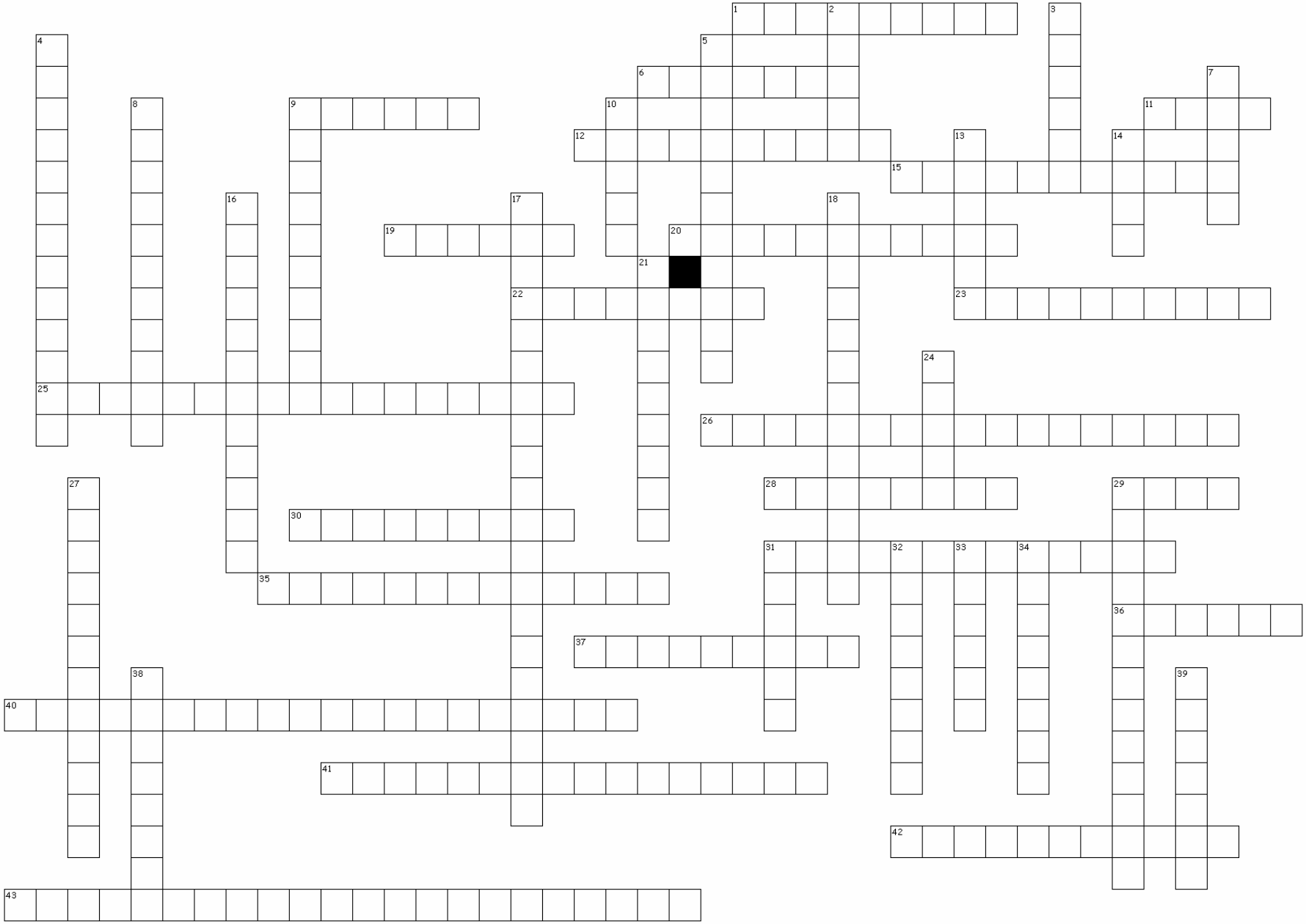
Steve's doctor first of all,…

29. The goals of Robert's heart surgery. → …

first of all – circumvent – in – thanks to – and secondly – repair – close properly – regurgitation

The goal of Robert's surgery was twofold,…

30. Make up one original question of your own relating to this section of the article, and write a 2-3 line answer to it using information either from the article or from outside sources.



Across	**Down**
1. 1. A part of the body, such as the mass of muscle fibers of the sinoatrial node, that sets the pace or rhythm of physiological activity. 2. Miniaturized and surgically implanted electronic devices used to stimulate or regulate contractions of the heart muscle *6. To remove impurities; To make pure; purge or clean* *9. A sudden intense pain in the chest caused by a momentary lack of adequate blood supply to the heart muscle.* *11. The point of culmination; The pointed end of an object* *12. Two large veins that drain blood from the upper body and from the lower body and empty into the right atrium of the heart* *15. A drug used in treating hypertension or arrhythmia; decreases force and rate of heart contractions by blocking beta-adrenergic receptors of the autonomic nervous system.* *19. An abnormal sound of the heart; sometimes a sign of abnormal function of the heart valves.* *20. A slender (long and thin) bundle of modified cardiac muscle that passes from the atrioventricular node in the right atrium to the right and left ventricles by way of the septum and that maintains the normal sequence of the heartbeat by conducting the wave of excitation from the right atrium to the ventricles* *22. Of muscular origin; arising from the muscles* *23. The muscular tissue of the heart* *25. A record of the electrical activity of the heart showing certain waves called P, Q, R, S, and T waves. The Q, R, S, T waves are associated with contraction of the ventricles.* *26. A feeling of difficult or labored breathing that is out of proportion to the patient's level of physical activity* *28. A hollow, flexible tube inserted into a body cavity, duct, or vessel to allow the passage of fluids or distend a passageway.* *29. A thick, viscous, or coagulated mass or lump, as of blood.* *30. The three-segmented valve of the heart that keeps blood in the right ventricle from flowing back into the right atrium* *31. The pressure exerted by the blood against the walls of the blood vessels, especially the arteries* *35. A thick, pale-yellow, explosive liquid formed by treating glycerin with nitric and sulfuric acids. It is used to make dynamite and in medicine to dilate blood vessels. Chemical formula C3H5N3O9.* *36. The energy, power, or work produced by a system etc.* *37. The number of heartbeats per unit of time (usually per minute)* *40. Necrosis of a region of the myocardium caused by an interruption in the supply of blood to the heart, usually as a result of occlusion of a coronary artery.* *41. A vein that is the largest vein in the human body, which returns blood to the right atrium of the heart from bodily parts below the diaphragm* *42. The membranous sac filled with serous fluid that encloses the heart and the roots of the aorta and other large blood vessels* *43. A condition in which the heart cannot pump enough blood to supply the body's tissues with sufficient oxygen and nutrients; back up of blood in vessels and the lungs causes buildup of fluid (congestion) in the tissues ; characterized by shortness of breath, weakness, and edema.*	*2. An excessive accumulation of serous fluid in tissue spaces or a body cavity.* *3. A valve of the heart, composed of two triangular flaps, that is located between the left atrium and left ventricle and regulates blood flow between these chambers.* *4. A substance in the blood whose level rises following a myocardial infarction.* *5. The restoration of blood flow to an organ or tissue that has had its blood supply cut off, as after a heart attack.* *7. The chambered, muscular organ that pumps blood received from the veins into the arteries, thereby maintaining the flow of blood through the entire circulatory system* *8. Sudden interruption or insufficiency of the supply of blood to the heart, typically resulting from occlusion or obstruction of a coronary artery and often characterized by severe chest pain.* *9. An abnormality in the rhythm of the heartbeat.* *10. To become inactive and lengthen (a muscle or muscle fiber)* *13. One of the upper chambers of the heart that receives blood from the veins and forces it into a ventricle* *14. The fibrous tissue that replaces normal tissue destroyed by injury or disease.* *16. A kind of drug that can break up clots blocking the flow of blood to the heart muscle.* *17. The passage of blood from the right atrium of the heart through the right ventricle and pulmonary arteries to the lungs where it is oxygenated and its return via the pulmonary veins to enter the left atrium* *18. Blood flow in the wrong direction (from a ventricle to an atrium or into the heart from an artery) through a valve that has failed to close completely.* *21. One of the two lower chambers of the heart which receive blood from the atria and pump it into the arteries* *24. The beginning or early stages, the initial (first) appearance of symptoms.* *27. The volume of blood pumped from a ventricle of the heart in one beat* *29. A colorless, odorless, incombustible gas, CO2, formed during respiration* *31. A passage created surgically to divert the flow of blood to circumvent an obstructed anatomical pathway, such as in an artery.* *32. The normal rhythmical relaxation and dilatation of the heart chambers, especially the ventricles, during which they fill with blood* *33. Movement or variation characterized by regular recurrence or alternation* *34. An abnormal enlargement of a part of the body as the result of injury or infection.* *38. A reference point used to indicate the initial condition against which future measurements are compared.* *39. To remove from consideration; exclude (as a possibility).*

- *about / 1. autour de, environ 2. au sujet de*
- *above / au dessus*
- *ACE inhibitor / inhibiteur de l'enzyme de conversion de l'angiotensine (n. m.)*
- *administer / administrer (médicament) NB. Ne pas confondre avec "administr-ate" qui correspond au sens "gérer" du verbe administrer*
- *again / encore une fois, une fois de plus*
- *agree on / se mettre d'accord sur, concorder*
- *allow / permettre*
- *almost / presque*
- *although / bien que*
- *amount / une quantité*
- *analgesia / l'analgésie (f.*
- *angina / une angine (de poitrine)*
- *annuloplasty / l'annuloplastie*
- *anterior / antérieur*
- *aorta / l'aorte (f.)*
- *apex, pl. apices / un apex, le sommet, la pointe*
- *approximate(ly) / à peu près, environ, approximativement*
- *area / une aire, une zone, une région*
- *arrhythmia / une arythmie cardiaque*
- *artery / une artère*
- *ascertain / établir, constater*
- *aspirate / aspirer*
- *atrium, pl. atria / l'atrium, l'oreillette (f.)*
- *backwards / en arrière*
- *balloon angioplasty / l'angioplastie transluminale percutanée*
- *baseline / de base, de référence*
- *basilar / basilaire*
- *bath / un bain*
- *beat / battre*
- *below / au-dessous de*
- *beta(ß)-blocker / un bêta(β)-bloquant*
- *blood / le sang*
- *blood pressure / la pression sanguine, la tension artérielle*
- *blood test / une analyse sanguine*
- *border / la limite, la frontière, la bordure*
- *bring about / entraîner, occasionner*
- *bundle / un faisceau*
- *bundle of His / le faisceau de His*
- *bypass / un pontage*
- *carbon dioxide / le dioxyde de carbone*
- *cardiac marker / un marqueur biologique de l'infarctus du myocarde*
- *cardiac muscle, myocardium / le myocarde*
- *cardiac vein, coronary vein / les veines coronaires ou cardiaques*
- *cardiovascular disease / les maladies cardio-vasculaires*
- *catheter / un cathéter, une sonde creuse*
- *cavity / une cavité*
- *central nervous system / le système nerveux central*
- *cerebrospinal nerves / les nerfs crâniens et rachidiens (spinaux)*
- *chamber / une cavité, une chambre*
- *chick / un poussin*
- *chiefly / surtout, principalement*
- *circuit / un circuit*
- *cleanse / dépurer, nettoyer, purifier*
- *close / (re)fermer, clore*
- *clot / un caillot*
- *collect / recueillir, accumuler, (recevoir)*
- *compensated heart failure / l'insuffisance cardiaque compensée*
- *conduct / conduire, amener, transmettre*
- *congestive or chronic heart failure (CHF) / l'insuffisance cardiaque, la défaillance cardiaque*
- *contraction / une contraction*
- *control (≠check) / contrôler, régler, commander*
- *coronary angiogram / une angiographie coronarienne*
- *coronary artery / une artère coronaire*
- *coronary sinus / le sinus coronaire*
- *covering (≠lining) / une enveloppe*
- *delay / retarder, un retard*
- *dependent on / dépendant de*
- *describe / décrire, définir*
- *diaphragmatic / diaphragmatique [NB diaphra(g)m; diaphra-G-matic — dans l'adjectif le "g" peut se prononcer ou pas.]*
- *diastole / la diastole*
- *die / mourir*
- *disability / un handicap, une infirmité*
- *disorder / un trouble, une maladie*
- *diuretic / un diurétique*
- *divide / diviser, séparer, partager*
- *downwards / vers le bas*
- *drop / baisser, retomber, diminuer*
- *dyspnea / la dyspnée*
- *early / 1. tôt, précoce, 2. initial, du début*
- *echocardiography / l'échocardiographie*
- *edema / un oedème*
- *effect / effectuer, réaliser*
- *eject / éjecter, expulser*
- *ejection fraction / la fraction d'éjection*
- *electrocardiogram / un électrocardiogramme*
- *embryo / un embryon*
- *emergency room (ER) or emergency department (ED) / le service des urgences*
- *empty into / se vider, se déverser*
- *endocardium / l'endocarde (m.)*
- *ensure (that) / assurer, garantir que*
- *exceed / dépasser, excéder*
- *excise / exciser*
- *exertion / l'exercice (m.), l'effort (m.)*
- *exertional / d'effort, dû à un exercice physique*
- *exit / la sortie*
- *expand / s'agrandir, se dilater*
- *face / être confronté à, se trouver face à*
- *fill with / se remplir de*
- *fist / le poing*
- *flap / un "rabat", un repli, un feuillet (cf. plus loin "leaflet)*
- *flow / couler, circuler*
- *fluid / un liquide*
- *follow / suivre*
- *follow-up / le suivi (médical), de suivi, de contrôle*
- *forwards / en avant, vers l'avant*
- *freely / librement*
- *full / plein, rempli*
- *go round / circuler, passer par*
- *goal / le but*
- *goal / le but*
- *half-moon / en demi-lune*
- *hang (down) / pendre, (re)tomber*
- *heart / le cœur*
- *heart attack / une crise cardiaque*
- *heart beat / le battement du cœur, une pulsation*
- *heart failure / l'insuffisance cardiaque*
- *heart rate / le rythme cardiaque, la fréquence cardiaque*
- *heart sound / un bruit cardiaque*
- *history / des antécédents, un passé*
- *hollow / creux*
- *holosystolic / holosystolique*
- *i.e. / c'est-à-dire, à savoir*
- *idiopathic / idiopathique*
- *impair / diminuer, affaiblir, détériorer*
- *impulse / une impulsion*
- *increase / augmenter, croître*
- *increasing / en augmentation, croissant, "de plus en plus de"*
- *inferior vena cava / la veine cave inférieure*
- *inherent / inhérent, propre*
- *injury / une blessure, une lésion, des dommages*
- *innervate / innerver*
- *intercostal / intercostal*
- *involve/ impliquer, concerner*
- *ischemic / ischémique*
- *jugular venous distention (JVD) / la turgescence (dilatation) jugulaire*
- *lack / un manque*
- *last / durer (NB ne pas confondre avec l'adjectif "last" = dernier)*
- *layer / une couche, une épaisseur, une strate*
- *leaflet (cf. flap) / un feuillet*
- *life threatening / potentiellement mortel, présentant un risque vital*
- *lifestyle / un mode de vie*
- *line / revêtir (l'intérieur), tapisser*

- *located / situé*
- *longitudinal(ly) / longitudinalement (NB longitudinally (from the bottom to the top of the organ) ≠ vertically (with relation to the anatomical position within the body))*
- *loud / fort, sonore*
- *lung / le poumon*
- *made up of / composé, constitué de*
- *mainly / principalement, surtout*
- *make S (to) V / faire (en sorte) que, faire faire*
- *manage / traiter, contrôler (NB. management = la prise en charge)*
- *mercury / le mercure*
- *mid-clavicular (line) / la ligne médio-claviculaire*
- *middle / du milieu, moyen, intermédiaire*
- *mild / léger*
- *mitral valve NB [maitr&l] / la valvule mitrale, bicuspide*
- *morphine / la morphine*
- *murmur / un souffle cardiaque*
- *muscle / un muscle*
- *muscle fibre / une fibre musculaire*
- *myocardial infarction (MI) / l'infarctus du myocarde*
- *myocardial infarction / l'infarctus du myocarde*
- *myocardium / le myocarde*
- *myogenic / myogène, myogénique*
- *nausea / la nausée*
- *needle / une aiguille, (hypodermique)*
- *nitroglycerin / la nitroglycérine, la trinitrine, la trinitrate de glycéryle*
- *obvious / manifeste, évident (NB. évident (fr.)≠evident(ang.))*
- *occlusion / une occlusion*
- *occur / se passer, se produire, survenir*
- *office visit / une consultation, une visite médicale*
- *onset / le début, l'apparition des premiers symptômes*
- *opposite / en face de, opposé*
- *organ / un organe*
- *orifice / un orifice*
- *outer / extérieur, externe*
- *output / production, rendement, débit*
- *outweigh / dépasser, l'emporter sur, compter plus que…*
- *oxygenate / oxygéner*
- *pacemaker / 1.le nœud sinusal (de Keith & Flack) 2.un stimulateur cardiaque (artificiel)*
- *pain / une douleur*
- *percutaneous coronary intervention (PCI) / l'intervention coronarienne percutanée*
- *perform / effectuer, réaliser*
- *pericardium / le péricarde*
- *posterior / postérieur, arrière*
- *prevalence / la prévalence*
- *prevent (from) / empêcher de*
- *previous / précédent*
- *prior to / préalablement à, avant*
- *propel / propulser*
- *proper / proprement dit*
- *proximal / proximal*
- *pulmonary artery / l'artère (f.) pulmonaire*
- *pulmonary circulation / la petite circulation*
- *pulmonary vein / la veine pulmonaire*
- *pump / pomper*
- *Purkinje fibers / fibres de Purkinje*
- *radiate / radier*
- *rales / des râles (m.)*
- *rate / un taux, le rythme*
- *referred to as / appelé, connu sous le nom de*
- *reflux / le reflux*
- *regurgitation / un reflux, la régurgitation (valvulaire)*
- *relax / se décontracter*
- *relaxation / la décontraction, le relâchement*
- *reperfusion / la reperfusion (myocardique)*
- *resolve / résoudre, faire disparaître*
- *result from / être la conséquence de, être provoqué par…*
- *rhythm / le rythme*
- *right / correct, …qu'il faut*
- *rise / monter, augmenter*
- *root / la racine*
- *round / tout au long de, (autour de) faire circuler*
- *rule out / exclure comme possibilité, écarter, invalider une hypothèse*
- *salt / un sel*
- *scar / une cicatrice*
- *schedule / programmer, prévoir (au planning)*
- *semi-lunar valves / une valvule sigmoïde*
- *send / envoyer, expédier*
- *septum / le septum*
- *serous membrane / une membrane séreuse*
- *setting / le cadre, le contexte*
- *shape / la forme*
- *-shaped / en forme de*
- *shorten / raccourcir, écourter*
- *shortness of breath / la dyspnée, l'essoufflement*
- *side / le côté*
- *since / 1. depuis (que) 2. puisque*
- *sinu-atrial, sinoatrial node / le nœud sino-auriculaire (de Keith et Flack)*
- *size / la taille*
- *so called / appelé ainsi, ainsi dit*
- *status / le statut*
- *stenosis / une sténose, un rétrécissement*
- *sternocostal / sternocostal*
- *stroke volume / le volume d'éjection (ventriculaire/systolique)*
- *superior vena cava / la veine cave supérieure*
- *supply / l'approvisionnement, l'alimentation*
- *sweating / la sueur, la transpiration*
- *swelling / la tuméfaction, une enflure NB enflé = "swollen"*
- *systemic circulation / la grande circulation*
- *systole / la systole*
- *team / une équipe*
- *thick / épais*
- *thoracic / thoracique*
- *thrombolytic / un fibrinolytique, un thrombolytique*
- *thrombosed / thrombosé*
- *throughout / partout dans, à travers la totalité*
- *time frame / un délai, une fenêtre*
- *to as much as / jusqu'à (atteindre)*
- *to…and back / (faire) aller et revenir, (faire un) aller-retour*
- *tricuspid valve / la valvule tricuspide*
- *undergo (-went, -gone) / subir*
- *upwards / vers le haut*
- *various / divers*
- *vary from… to / varier entre… et, de… à, aller de… à*
- *vein / une veine*
- *venae cavae / les veines caves*
- *ventricle / le ventricule*
- *vertebra, pl. -ae / une vertèbre*
- *volume / un volume*
- *wall / une paroi*
- *weigh / peser*
- *while / 1. (ce)pendant que 2. tandis que*
- *whole / entier*
- *within / 1. à l'intérieur de, 2. dans une fenêtre de (temps), avant que… ne soit écoulé*
- *wrap (around) / entourer, s'enrouler autour*