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## Cardiovascular: Heart & Cardiac Cycle

Printable Flashcards — Pre-Med Biology

Heart anatomy, valves, blood flow, cardiac cycle phases, conduction system, ECG waves, and hemodynamics.

210 cards — Print double-sided, flip on long edge, then cut along dashed lines.

210 cards — Printable Flashcards

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1

Right side of the heart handles... blood.

2

Left side of the heart handles... blood.

3

Blood flow: body -> right atrium comes through the...

4

Blood flow: right atrium -> right ventricle goes through the... valve.

5

Blood flow: right ventricle -> lungs goes through the... valve.

6

Blood flow: lungs -> left atrium returns through the...

7

Blood flow: left atrium -> left ventricle goes through the... valve.

8

Blood flow: left ventricle -> body goes through the... valve.

2

Oxygenated blood (coming back from the lungs).

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1

Deoxygenated blood (coming back from the body).

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4

Tricuspid valve.

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3

Venae cavae (superior and inferior vena cava).

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6

Pulmonary veins.

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5

Pulmonary (semilunar) valve.

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Aortic (semilunar) valve.

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Mitral (bicuspid) valve.

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9

Pulmonary artery carries... blood. (TRAP card)

10

Pulmonary veins carry... blood. (TRAP card)

11

Artery vs vein: what's the real definition?

12

Which chamber has the thickest wall?

13

Right ventricle wall is thinner because it pumps to...

14

Atria vs ventricles: who does the heavy pumping?

15

Trick: atria contract during ventricular...

16

Atrioventricular (AV) valves are the... valves.

10

Oxygenated blood.

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9

Deoxygenated blood.

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12

Left ventricle.

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11

Arteries carry blood away from the heart.  
Veins carry blood toward the heart.

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14

Ventricles.

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13

The lungs (lower pressure circuit).

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16

Mitral + tricuspid.

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15

Diastole (filling).

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17

Semilunar valves are the... valves.

18

Valve opening/closing is mainly caused by...

19

Chordae tendineae + papillary muscles job is to...

20

Semilunar valves have chordae tendineae. True or false?

21

Cardiac cycle big picture: diastole is when the ventricle is...

22

Cardiac cycle big picture: systole is when the ventricle is...

23

During ventricular diastole, the AV valves are usually...

24

During ventricular diastole, the semilunar valves are...

18

Pressure differences.

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17

Aortic + pulmonary.

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20

False.

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19

Prevent AV valves from flipping backward (prolapse) during ventricular contraction.

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22

Contracting and ejecting blood.

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21

Relaxing and filling.

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24

Closed.

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23

Open.

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25

During ventricular systole (ejection), AV valves are...

26

During ventricular systole (ejection), semilunar valves are...

27

Isovolumetric contraction: what's happening?

28

Isovolumetric relaxation: what's happening?

29

When do AV valves open?

30

When do semilunar valves open?

31

When do semilunar valves close?

32

When do AV valves close?



26

Open (once ventricular pressure exceeds artery pressure).

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25

Closed.

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28

Ventricle relaxes but volume stays the same because ALL valves are closed.

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27

Ventricle contracts but volume stays the same because ALL valves are closed.

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30

When ventricular pressure  $>$  aorta/pulmonary artery pressure (during systole).

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When atrial pressure  $>$  ventricular pressure (early diastole).

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32

When ventricular pressure  $>$  atrial pressure (start of systole).

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31

When arterial pressure  $>$  ventricular pressure (start of diastole).

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33

End-diastolic volume (EDV) is...

34

End-systolic volume (ESV) is...

35

Stroke volume (SV) =

36

Ejection fraction (EF) is basically...

37

Cardiac output (CO) =

38

If heart rate gets very high,  
filling time (diastole) gets...

39

S1 ('lub') is caused by closure of the...

40

S2 ('dub') is caused by closure of the...



34

The volume left in the ventricle after contraction (end of systole).

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33

The volume in the ventricle at the end of filling (end of diastole).

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36

The fraction of EDV that gets pumped out (SV/EDV).

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35

EDV - ESV.

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38

Shorter (a lot).

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37

Heart rate  $\times$  stroke volume ( $CO = HR \times SV$ ).

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40

Semilunar valves (aortic + pulmonary).

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39

AV valves (mitral + tricuspid).

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41

S1 happens at the start of ventricular...

42

S2 happens at the start of ventricular...

43

Trap: S1 is the semilunar valves closing. True or false?

44

Why do valves make sounds?

45

Extra heart sounds (S3/S4) are normally...

46

If a valve is leaky (regurgitation), you often hear...

47

If a valve is narrowed (stenosis), you often hear...

48

Normal conduction pathway (in order):



42

Diastole.

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41

Systole.

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44

Because of vibrations/turbulence when they snap shut and blood changes direction.

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43

False.

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46

A murmur (turbulent flow).

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45

Not prominent in healthy adults (high-level).

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48

SA node -> atria -> AV node -> bundle of His -> bundle branches -> Purkinje fibers -> ventricles.

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47

A murmur (turbulent flow through a narrow opening).

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49

SA node is the heart's...

50

Where is the SA node? (basic)

51

AV node's job is to...

52

Where is the AV node? (basic)

53

Bundle of His (AV bundle) does what?

54

Purkinje fibers are specialized for...

55

Why do ventricles need to contract 'together'?

56

Pacemaker hierarchy (fastest to slowest):



50

Right atrium (near where the vena cava enters).

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49

Natural pacemaker (normally starts each heartbeat).

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52

At the junction between atria and ventricles (near the septum).

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51

Delay the signal so ventricles fill before they contract.

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54

Fast conduction through ventricles so they contract together.

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53

Carries the signal from AV node into the ventricles.

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56

SA node > AV node > Purkinje/ventricular pacemakers.

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55

To generate a strong, coordinated ejection of blood.

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57

If the SA node fails, the heart stops. True or false?

58

Contractile cardiac muscle cells vs pacemaker cells: which one makes most of the force?

59

Pacemaker (autorhythmic) cells are special because they...

60

Autonomic nerves make the heart beat. True or false?

61

Sympathetic stimulation generally makes heart rate...

62

Parasympathetic (vagus) stimulation generally makes heart rate...

63

P wave represents...

64

QRS complex represents...



58

Contractile cells.

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57

False.

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60

False.

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59

Depolarize spontaneously (no outside nerve needed to start each beat).

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62

Go down.

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61

Go up.

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64

Ventricular depolarization.

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63

Atrial depolarization.

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65

T wave represents...

66

Trap: T wave is ventricular contraction. True or false?

67

Electrical events come before mechanical events. Example: QRS happens before...

68

Why is atrial repolarization hard to see on ECG?

69

PR interval mainly reflects...

70

ST segment is when ventricles are... (high-level)

71

Cardiac muscle is...

72

Intercalated discs contain... (2 key connections)



66

False.

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65

Ventricular repolarization.

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68

It's hidden inside the QRS complex.

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67

Ventricular contraction (systole).

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70

Depolarized (plateau phase, roughly).

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69

Time from atrial depolarization to ventricular depolarization (includes AV node delay).

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72

Gap junctions and desmosomes.

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71

Striated, involuntary, and connected by intercalated discs.

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73

Gap junctions are important because they...

74

Cardiac muscle can't be tetanized like skeletal muscle because... (high-level)

75

Pacemaker cells vs contractile cells: which has the most stable resting potential?

76

Purkinje fibers are more like... pacemaker or contractile cells?

77

Blood pressure is highest in the...

78

Blood pressure is lowest in the... (big vessel type)

79

Why do veins have valves?

80

Systolic blood pressure corresponds mainly to ventricular...

74

It has a long refractory period.

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73

Let ions/current spread cell-to-cell (cells act in sync).

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76

Specialized conduction cells (not mainly force producers).

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75

Contractile cells (pacemaker cells drift upward).

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78

Veins (especially vena cava).

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77

Arteries.

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80

Systole (ejection).

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79

To prevent backflow (especially in limbs).

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81

Diastolic blood pressure corresponds mainly to ventricular...

82

Pulse is...

83

Mean arterial pressure (MAP) is closer to... diastolic or systolic?

84

Coronary arteries feed the heart muscle. They get most blood flow during...

85

Why can very high heart rate reduce coronary perfusion?

86

If left ventricular pressure < left atrial pressure, the mitral valve is...

87

If left ventricular pressure > left atrial pressure, the mitral valve is...

88

If left ventricular pressure < aortic pressure, the aortic valve is...

82

A pressure wave in arteries, not a blob of blood moving down the arm.

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81

Diastole (relaxation).

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84

Diastole.

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83

Diastolic (because we spend more time in diastole).

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86

Open.

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85

Because diastole shortens a lot, and coronary flow is mostly in diastole.

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88

Closed.

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87

Closed.

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89

If left ventricular pressure > aortic pressure, the aortic valve is...

90

Isovolumetric contraction: which valves are open?

91

Isovolumetric relaxation: which valves are open?

92

Ventricular filling phase: which valves are open?

93

Ventricular ejection phase: which valves are open?

94

Frank-Starling law (simple): more filling ->

95

Preload (basic meaning) is basically...

96

Afterload (basic meaning) is basically...



90

None. All valves are closed.

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89

Open.

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92

AV valves open, semilunar valves closed.

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91

None. All valves are closed.

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94

Stronger contraction (up to a point).

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Semilunar valves open, AV valves closed.

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96

The pressure the ventricle must pump against (like arterial pressure).

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95

How much the ventricle is filled/stretched before it contracts (related to EDV).

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97

Contractility means...

98

If afterload increases a lot, stroke volume tends to...

99

If preload increases (more filling), stroke volume tends to...

100

Mitral valve is on the... side of the heart.

101

Tricuspid valve is on the... side of the heart.

102

Aortic valve is between...

103

Pulmonary valve is between...

104

Trap: 'Diastole = heart is doing nothing.' True or false?



98

Decrease (harder to eject).

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97

How strongly the heart contracts at a given preload (independent of filling).

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100

Left.

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99

Increase (Frank-Starling).

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102

Left ventricle and aorta.

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101

Right.

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104

False.

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103

Right ventricle and pulmonary artery.

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105

Trap: valves are opened by papillary muscles pulling them open. True or false?

106

If you hear 'semilunar', think...

107

If you hear 'AV valve', think...

108

Atrial systole contributes roughly...  
(basic idea) to ventricular filling at rest.

109

Fastest normal pacemaker is the...

110

Slowest backup pacemaker (last resort) is in the...

111

AV node delay is useful because it...

112

If the AV node is completely blocked,  
ventricles can still beat because...



106

Aortic/pulmonary valves (ventricle exits).

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105

False.

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108

A small top-up (about 10-20%).

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107

Mitral/tricuspid (between atrium and ventricle).

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110

Ventricular conduction system  
(Purkinje/ventricular cells).

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109

SA node.

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112

They have their own slow  
pacemaker activity (escape rhythm).

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111

Prevents ventricles from contracting before they fill.

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113

What spreads the impulse fastest through the ventricles?

114

Why is QRS narrow in a normal ECG? (concept)

115

Nodal (pacemaker) cells are found mainly in the...

116

Contractile cardiomyocytes are mainly in the...

117

During isovolumetric contraction, ventricular pressure goes... while volume stays...

118

During ejection, ventricular volume goes...

119

During isovolumetric relaxation, ventricular pressure goes... while volume stays...

120

During filling, ventricular volume goes...



114

Because ventricles depolarize quickly via the conduction system.

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113

Purkinje fibers.

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Atrial and ventricular myocardium (the muscle walls).

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115

SA node and AV node.

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118

Down.

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117

Up; the same.

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120

Up.

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119

Down; the same.

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121

Which phase creates the highest ventricular pressure?

122

If a question says 'volume constant but pressure changing', what phase is it?

123

Scenario: you need higher cardiac output quickly (exercise). Two main levers are...

124

Scenario: sympathetic activation. What happens to HR and contractility?

125

Scenario: vagus nerve activation. What happens to HR?

126

Scenario: blood loss (less venous return). Preload goes... and stroke volume tends to...

127

Scenario: dehydration. Why might HR rise?

128

Scenario: standing up quickly. Why might you feel dizzy? (basic)



122

Isovolumetric contraction  
or isovolumetric relaxation.

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121

Ventricular systole (especially during ejection).

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124

Both increase.

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123

Increase heart rate and increase stroke volume.

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126

Down; down.

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125

It decreases.

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128

Temporary drop in venous return  
and blood pressure to the brain.

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127

To maintain cardiac output when  
stroke volume drops (less filling).

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129

Natural pacemaker of the heart:

130

Valve between left atrium and left ventricle:

131

Valve between right atrium and right ventricle:

132

Valve from left ventricle to aorta:

133

Valve from right ventricle to pulmonary artery:

134

S1 ('lub') = closure of which valves?

135

S2 ('dub') = closure of which valves?

136

P wave represents:

130

Mitral (bicuspid) valve

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SA node

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Aortic valve

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131

Tricuspid valve

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AV valves (mitral and tricuspid)

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133

Pulmonary valve

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Atrial depolarization

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Semilunar valves (aortic and pulmonary)

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137

QRS complex represents:

138

T wave represents:

139

Cardiac output formula:

140

Stroke volume formula:

141

Main phase of coronary perfusion  
(heart muscle blood flow):

142

Blood flow: body -> {{c1::right atrium}} -> {{c2::right ventricle}} -> lungs -> {{c3::left atrium}} -> {{c4::left ventricle}} -> body.

143

Valve order (right side): RA -> {{c1::tricuspid}}  
-> RV -> {{c2::pulmonary}} valve -> lungs.

144

Valve order (left side): LA -> {{c1::mitral}}  
-> LV -> {{c2::aortic}} valve -> body.

138

Ventricular repolarization

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137

Ventricular depolarization

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140

$SV = EDV - ESV$

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139

$CO = HR \times SV$

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142

Blood flow: body -> right atrium -> right ventricle  
-> lungs -> left atrium -> left ventricle -> body.

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141

Diastole

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144

Valve order (left side): LA -> mitral  
-> LV -> aortic valve -> body.

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143

Valve order (right side): RA -> tricuspid  
-> RV -> pulmonary valve -> lungs.

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145

Conduction pathway: {{c1::SA node}}  
-> {{c2::AV node}} -> {{c3::bundle  
of His}} -> {{c4::Purkinje}}.

146

P wave = {{c1::atrial depolarization}}; QRS  
= {{c2::ventricular depolarization}}; T  
wave = {{c3::ventricular repolarization}}.

147

S1 = {{c1::AV}} valve closure; S2  
= {{c2::semilunar}} valve closure.

148

Isovolumetric contraction: all valves  
{{c1::closed}} and pressure goes {{c2::up}}.

149

Isovolumetric relaxation: all valves  
{{c1::closed}} and pressure goes {{c2::down}}.

150

Filling phase: AV valves {{c1::open}},  
semilunar valves {{c2::closed}}.

151

Ejection phase: semilunar valves  
{{c1::open}}, AV valves {{c2::closed}}.

152

Definitions: systole = {{c1::contraction}};  
diastole = {{c2::relaxation/filling}}.



146

P wave = atrial depolarization; QRS = ventricular depolarization; T wave = ventricular repolarization.

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145

Conduction pathway: SA node -> AV node -> bundle of His -> Purkinje.

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148

Isovolumetric contraction: all valves closed and pressure goes up.

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147

S1 = AV valve closure; S2 = semilunar valve closure.

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150

Filling phase: AV valves open, semilunar valves closed.

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149

Isovolumetric relaxation: all valves closed and pressure goes down.

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152

Definitions: systole = contraction; diastole = relaxation/filling.

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151

Ejection phase: semilunar valves open, AV valves closed.

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153

$$\text{CO} = \text{HR} \times \text{SV};$$
$$\text{SV} = \text{EDV} - \text{ESV}.$$

154

Pulmonary artery carries deoxygenated blood; pulmonary vein carries oxygenated blood.

155

Which event happens first: AV valves close or semilunar valves open?

156

Which event happens first: semilunar valves close or AV valves open?

157

If the ventricle is contracting but no blood is leaving, you're in...

158

If the ventricle is relaxing but not filling yet, you're in...

159

Why do we even have an isovolumetric contraction phase?

160

Why do we even have an isovolumetric relaxation phase?



154

Pulmonary artery carries deoxygenated blood;  
pulmonary vein carries oxygenated blood.

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153

$$CO = HR \times SV; SV = EDV - ESV.$$

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156

Semilunar valves close first.

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155

AV valves close first.

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158

Isovolumetric relaxation.

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157

Isovolumetric contraction.

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160

To let ventricular pressure drop below  
atrial pressure before filling starts.

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159

To build enough pressure to  
open the semilunar valves.

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161

Diastole is important for filling AND for...

162

If someone says 'arteries always carry oxygenated blood', the counterexample is...

163

If someone says 'veins always carry deoxygenated blood', the counterexample is...

164

Septum is the wall that separates...

165

Systemic circulation is...

166

Pulmonary circulation is...

167

Why does the left ventricle need more force than the right ventricle?

168

Coronary arteries supply blood to the...



162

Pulmonary artery.

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161

Coronary blood flow.

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164

Right and left sides of the heart.

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163

Pulmonary veins.

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166

Right heart -> lungs -> left heart.

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165

Left heart -> body -> right heart.

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168

Myocardium (heart muscle).

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167

Because systemic circulation has higher resistance/pressure than pulmonary circulation.

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169

Coronary circulation is separate from blood inside the chambers. True?

170

Depolarization means...

171

Repolarization means...

172

Common trap: 'The heart contracts because nerves tell it to.' Fix this sentence.

173

Common trap: 'Valves open because the heart pulls them open.' Fix this sentence.

174

Common trap: 'Systole is when the heart fills.' Fix this sentence.

175

Why does blood normally flow one-way through the heart?

176

If ventricular pressure is lower than atrial pressure, blood will...



170

Electrical activation of a cell  
(triggers contraction in muscle).

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169

True.

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172

The heart contracts because pacemaker  
cells fire; nerves just speed up/slow down.

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171

Electrical recovery/reset for the next beat.

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174

Diastole is filling; systole is ejection.

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173

Valves open/close because of pressure differences.

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176

Flow into the ventricle (if AV valve is open).

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175

Because pressure gradients + one-  
way valves prevent backflow.

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177

Why do ventricles have thicker walls than atria?

178

If the left ventricle fails to pump well, which side backs up first: lungs or body?

179

If the right ventricle fails, which side backs up first: lungs or body veins?

180

Cardiac cycle (ventricle-focused) in order:

181

Most ventricular filling happens when the ventricle is...

182

Atrial systole happens... diastole.

183

During ventricular systole, the atria are mostly...

184

During ventricular diastole, the atria are mostly...



178

Lungs (pulmonary congestion).

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177

They must generate much higher pressure to pump blood out of the heart.

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180

Filling -> atrial systole -> isovolumetric contraction -> ejection -> isovolumetric relaxation -> back to filling.

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179

Body veins (systemic venous congestion).

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182

At the end of ventricular diastole.

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181

Relaxed (early diastole).

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184

Emptying into ventricles (and then briefly contracting at the end).

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183

Filling (atrial diastole).

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185

If you hear 'diastasis' in a diagram, it means...

186

Rapid filling happens right after...

187

S1 happens just after which ECG event?

188

S2 happens around the end of... (ECG idea)

189

P wave is followed by... mechanically.

190

QRS is followed by... mechanically.

191

T wave is followed by... mechanically.

192

Mitral valve is also called...



186

Isovolumetric relaxation, when AV valves open.

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185

Slow filling phase (mid-diastole).

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188

Ventricular repolarization (around the T wave/end of systole).

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187

Just after the QRS (start of ventricular systole).

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190

Ventricular contraction (ventricular systole).

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189

Atrial contraction (atrial systole).

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192

Bicuspid valve.

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191

Ventricular relaxation (start of diastole).

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193

Bicuspid literally means...

194

Tricuspid literally means...

195

Semilunar valves usually have... cusps.

196

Papillary muscles contract during...

197

Pulse pressure =

198

Mean arterial pressure (MAP) rough estimate:

199

If stroke volume increases, pulse pressure tends to... (basic)

200

Big artery stiffness tends to make pulse pressure...



194

Three cusps/leaflets.

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193

Two cusps/leaflets.

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196

Ventricular systole.

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195

Three.

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198

MAP diastolic +  $\frac{1}{3}$ (pulse pressure).

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197

Systolic BP - diastolic BP.

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200

Increase.

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199

Increase.

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201

Baroreceptors are pressure sensors mainly in the...

202

If blood pressure suddenly drops,  
reflex response is usually...

203

If blood pressure suddenly rises,  
reflex response is usually...

204

Baroreceptor reflex is fast or slow?

205

Why does the heart need lots of oxygen?

206

If coronary blood flow is reduced, the first  
thing the heart muscle struggles with is...

207

Right heart pumps to the `{{c1::lungs}}`;  
left heart pumps to the `{{c2::body}}`.

208

Valve rule: valves open when pressure  
`{{c1::behind}}` > pressure `{{c2::ahead}}`.



202

Increase heart rate and constrict blood vessels.

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201

Carotid sinus and aortic arch.

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204

Fast (seconds).

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203

Decrease heart rate and dilate vessels (reduce pressure).

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206

Oxygen supply (ischemia).

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205

It works nonstop and relies heavily on aerobic metabolism.

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208

Valve rule: valves open when pressure behind > pressure ahead.

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207

Right heart pumps to the lungs; left heart pumps to the body.

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209

Papillary muscles + chordae tendineae prevent  
AV valve prolapse during systole.

210

Diastole shortens most when  
heart rate increases.

210

Diastole shortens most when heart rate increases.

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209

Papillary muscles + chordae tendineae prevent AV valve prolapse during systole.

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