Model Answers: Easy

1

The correct answer is **D** because:

- During systole the atria contract, closely followed by the ventricles
- Blood pressure is measured as the **pressure** inside the arteries
- **Systolic** blood pressure would be measured at the end of systole in the heart when the pressure in the arteries is at a maximum.

A is incorrect as the blood pressure in the arteries when the heart is relaxed (in diastole) is called **diastolic blood pressure.**

B is incorrect as the right ventricle pumps blood to the **lungs**; this occurs at a much lower pressure than that generated by the left ventricle pumping blood to the **body**.

C is incorrect as after contraction (systole), the pressure in the left ventricle is reduced as blood pressure is now generated in the **arteries.**

2

The correct answer is **C** because:

- The aorta is the largest artery in the body**,** leaving the left side of the heart
- Once the blood has left the heart through the **aortic** valve, it travels through the **aorta**, which makes a cane-shaped curve and is connected with other major arteries to deliver oxygen-rich blood to tissues in the body

A is incorrect as the vessel labelled A is the pulmonary artery, taking deoxygenated blood from the right side of the heart to the lungs.

B is incorrect as the vessel labelled B is the vena cava, this is the vein that brings deoxygenated blood from the tissues to the right atrium.

D is incorrect as the vessel labelled D is the pulmonary vein, bringing oxygenated blood from the lungs to the left atrium.

3

The correct answer is **D** because:

- The arrow labelled **D** is the left ventricle
- The graph shows at 0.2s that the left ventricle is increasing in pressure, this means that ventricular systole has started, and the pressure is building in the left ventricle due to ventricular muscle contraction

A is incorrect as the area of the heart labelled **A** is the septum, this separates the left and right-hand sides of the heart.

B is incorrect as the area of the heart labelled **B** is the aorta, this transports the oxygenated blood under pressure to the tissues of the body. The pressure in the aorta starts to increase after 0.2s in the graph.

C is incorrect as the area of the heart labelled **C** is the left atrium. Atrial systole can be seen in the graph between 0 and 0.2s.

4

The correct answer is **C** because:

- **Ventricular diastole** is the relaxation of the muscles in the ventricles of the heart
- During ventricular diastole, the **atrioventricular valves** are **open** to allow passive filling of the atria and ventricles (as a result of the force of gravity pulling blood down)

A is incorrect as the pressure in the two atria is different; the left side of the heart having a pressure up to 8 mm Hg, the right side less than 5 mm Hg. During ventricular diastole the pressure in the atria doesn't change.

B is incorrect as the pressure in the atria is not higher than the ventricles at any point in the heart cycle.

D is incorrect as the semilunar valves are at the base of the arteries leaving the heart, during diastole these valves would be closed to prevent backflow of blood into the heart.

5

The correct answer is **D** because:

- The **aorta** is the main artery leaving the heart, transporting oxygenated blood from the heart to the blood tissues; its average wall thickness is about 2 mm
- Arteries have three layers; the endothelial layer lining the lumen is called the **tunica intima,** a middle thicker layer called the **tunica media**, and an outer layer called the **tunica external**
- The tunica **media** and tunica **externa** both contain **elastic** fibres and **collagen**
- The elastin fibres allows the arteries to **stretch** and **recoil** allowing the blood to flow at high pressures
- The collagen fibres provide **strength** to the artery wall

A is incorrect as the tunica media contains **smooth muscle** and arteries do have a relatively small lumen, but neither of these features will enable the artery to withstand the high pressures in the aorta.

B is incorrect as while the artery does contain large quantities of elastin fibres they do not have a large lumen

C is incorrect as while the artery does contain large quantities of collagen, they do not contain endometrial tissue. The **endometrium** is the innermost lining of the uterus.

6

The correct answer is **A** because:

- During **ventricular systole**, both ventricles are **contracting**. The pressure in the left ventricle will increase due to the contraction of the muscles
- The **high pressure** in the ventricles **opens** the **semilunar valves**, it is at this point that the pressure in the aorta will increase

B is incorrect as the bicuspid valve is an **atrioventricular valve** between the left atrium and left ventricle, this will close during ventricular systole to prevent backflow into the heart. The **semilunar valves** would need to open not close as the pressure in the ventricles increases.

C is incorrect a the bicuspid valve is an **atrioventricular valve** between the left atrium and left ventricle, this will need to close during ventricular systole to prevent backflow into the heart. The **semilunar valves** would open as the pressure in the ventricles increases.

D is incorrect as it is not possible for the pressure in the left atrium to become higher than that of the left ventricle; the wall of the atria is much thinner than the wall of the ventricle and most blood fills ventricles from the atria as a result of the force of gravity acting on it.

7

The correct answer is **B** because:

- The **semilunar valves** are found at the base of the arteries leaving the heart, they would need to be open during **ventricular systole** to allow the blood to leave the heart and fill the pulmonary artery and aorta
- The **atrioventricular valves** are the valves that separate the atria and ventricles, they would need to **close** to prevent backflow of blood into the atria

A is incorrect as the **atrioventricular valves** would need to be **closed** to prevent backflow of blood.

C is incorrect as the **semilunar valves** would need to be **open** to allow the blood to leave the heart.

D is incorrect as if both sets of valves were closed then the blood would have no route out of the heart and high pressure would build-up.

8

The correct answer is **D** because:

- After **atrial systole**, there is a fraction of a second pause as the wave of contraction is transmitted through the Purkyne tissue through the septum
- The blood has been pushed from the atria to the ventricles
- The ventricles start to contract, it is at this point the **atrioventricular valves** (**bicuspid** on the left and the **tricuspid** on the right) close to prevent backflow into the atria as the pressure in the ventricles increases
- It is the closing of these valves that causes the characteristic **'lub'** sound in the heartbeat

A, B & **C** are incorrect as they all include **option 1** (closing of the semilunar valves). During atrial systole, the semilunar valves at the base of the arteries leaving the heart are closed. The closing of the semilunar valves produces the **'dub'** sound.

9

The correct answer is **A** because:

- **Ventricular systole** is the contraction of the ventricles.
- The contraction of the muscles will cause an increase in ventricle pressure.
- The **atrioventricular valves** will be closed to prevent backflow into the atria. This means that the pressure within the atria will not change

B, C & **D** are incorrect as all these options include statement 3 ("the aortic pressure will increase"). This will only happen once the pressure in the ventricles has increased enough to force open the semilunar valves.

10

The correct answer is **C** because:

- The **Purkyne tissue** is found in the walls of the inner ventricles of the heart.
- At the start of the heartbeat, the **sinoatrial node** (SAN) in the wall of the right atrium sends out a wave of excitation to the atria.
- A band of nonconductive collagen tissue prevents the wave from being passed from the atria to the ventricles
- The waves are transferred to the atrioventricular node and passed through the bundle of His in the septum.
- The bundle of His then conduct the wave of excitation to the Purkyne tissue in the ventricles

A is incorrect as the role of the septum is to separate the two sides of the heart and prevent the mixing of oxygenated and deoxygenated blood

B is incorrect as the role of the **sinoatrial node** is to control the heartbeat. This is known as the pacemaker of the heart

D is incorrect as the muscle fibres in the atria conduct the wave of excitation started by the sinoatrial node. Purkyne tissue are not found in atrial walls