2.2 Heart, blood and CHD

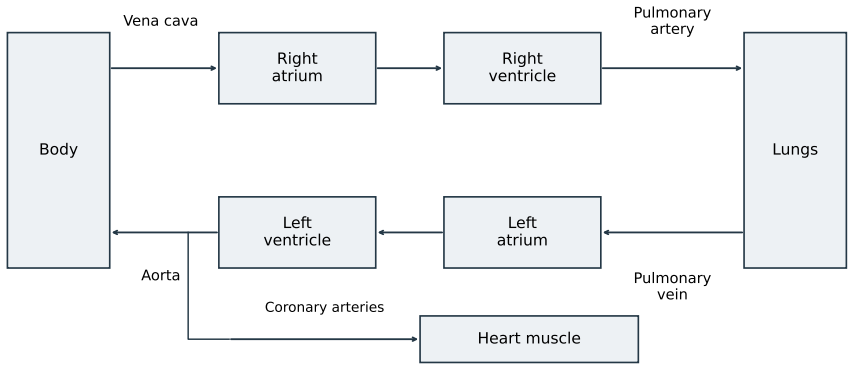
Name: _____ Class: _____ Date: _____ **Total: 18 marks**

KEY WORDS alveoli • plasma • red blood cells • white blood cells • platelets • stents • statins

Objective

Label the heart and its vessels, explain double circulation, compare arteries/veins/capillaries, and evaluate CHD treatments. Original questions for spec statements 4.2.2.2–4.2.2.4.

1 Key knowledge and worked examples

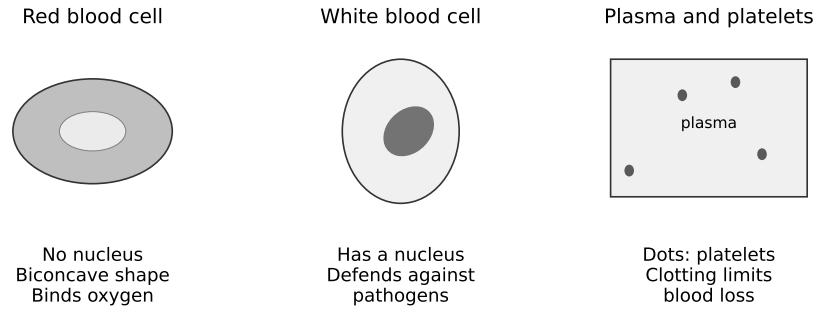


Teacher flow model, not an anatomical layout: follow the arrows, not the position on this page. Body → vena cava → right atrium → right ventricle → pulmonary artery → lungs → pulmonary vein → left atrium → left ventricle → aorta → body. **Coronary arteries** branch from the aorta to supply heart muscle itself. Blood in the chambers does not directly supply all the muscle.

Double circulation: in one complete body–lung circuit blood passes through the heart twice. The right ventricle pumps to the lungs; the left pumps around the body at higher pressure and has a thicker muscular wall. Pressure/resistance, rather than "distance" alone, explains the difference. Valves prevent backflow; atria receive returning blood and ventricles pump blood out.

Arteries carry blood **away from** the heart; veins carry it **towards** the heart. The pulmonary artery carries deoxygenated blood; the pulmonary vein carries oxygenated blood, so oxygen content does not define an artery or vein. Cells in the **right atrium** form the natural pacemaker; an artificial pacemaker corrects an irregular rhythm.

Vessel	Structure → function
Artery	Thick muscular/elastic wall withstands high pressure; elastic recoil helps maintain flow
Vein	Wider lumen, thinner wall; valves reduce backflow at low pressure
Capillary	Wall one cell thick gives a short exchange path



Teacher cell models, not to scale. The red cell's pale centre represents a depression, not a nucleus. **Blood** is a tissue: **plasma** carries dissolved glucose, amino acids, CO_2, urea and hormones, and distributes heat. **Red blood cells** have haemoglobin to bind oxygen, no nucleus (more room for haemoglobin) and a biconcave shape (large surface area for rapid exchange). **White blood cells** have nuclei; some engulf pathogens and others produce antibodies. **Platelets** are cell fragments involved in clotting, reducing blood loss and pathogen entry.

CHD: fatty material narrows the coronary arteries → reduced flow to heart muscle → reduced oxygen/glucose supply → less aerobic respiration and energy release → weaker contraction / fatigue. Exercise raises demand; restricted supply can contribute to chest pain. A percentage blockage does not imply the same percentage fall in flow.

Treatment	Benefit	Limitation / risk
Stent	Holds narrowed artery open; improves flow	Procedure risks; does not prevent new deposits
Statin	Lowers cholesterol; slows fatty deposits	Long-term medication; possible side effects
Replacement valve	Restores effective one-way flow	Surgery; mechanical valves need anticoagulants
Heart transplant	Replaces a failing heart	Donor shortage; rejection; immunosuppression
Artificial heart	Maintains pumping while awaiting transplant	Infection/clotting risk; device limitations

> **Worked comparison (sheet Q3.2):** stent → holds the artery open → improves flow promptly, but has procedure risks and does not stop future deposits. Statin → lowers cholesterol → slows deposits, but requires ongoing medication and may have side effects. These treatments can be combined; no single best choice is established without patient context. Leaking valves cause backflow; restricted valves impede flow. Transplants/artificial hearts address severe pump failure. Bypass diverts flow around a blockage.

2 Practice

2.1 Name the blood vessels carrying blood to and from the lungs. [2]

2.2 Give two adaptations of red blood cells and say what each is for. [2]

2.3 Explain why the left ventricle wall is thicker than the right. [2]

3 Exam-style questions

3.1 Explain how the structure of an artery is adapted to its function. [4]

3.2 A patient has CHD. Evaluate stents against statins for treatment. [4]

3.3 The coronary arteries of a patient are 35% blocked.

(a) Explain why the patient gets chest pain during exercise. [3]

(b) Name one other treatment if stents fail. [1]