Coronary heart disease: a non-communicable disease

4.2.2.4 · Biology · revision notes

What coronary heart disease (CHD) is, and how CHD, faulty heart valves and heart failure are treated with drugs (statins), mechanical devices (stents, replacement valves, artificial hearts) or transplants. Expect 'explain' questions on how CHD damages the heart and 6-mark 'evaluate' questions comparing treatments.

Key facts

- CHD: fatty material builds up in the coronary arteries → narrower → less blood flow → less oxygen for the heart muscle
- Statins: lower blood cholesterol → slow down fatty deposits
- Replacement valves: biological (animal or human) or mechanical
- Artificial heart: usually temporary, until a transplant or while the heart rests
- Stent: a mesh tube that keeps a coronary artery open
- Faulty valve: does not open fully or leaks → heart pumps less efficiently
- Heart failure: transplant of a donor heart, or heart and lungs
- Transplant problems: donor shortage, rejection, lifelong immunosuppressant drugs

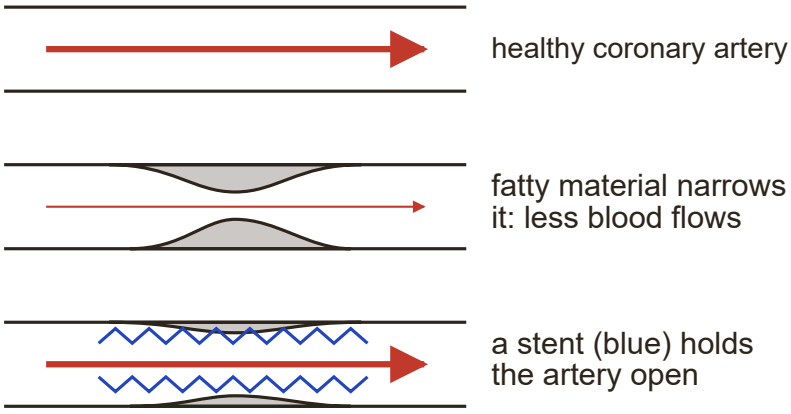
Notes

Coronary heart disease

- CHD is a **non-communicable** disease: it cannot be passed from one person to another.
- The **coronary arteries** supply the heart muscle with oxygenated blood.
- In CHD, layers of **fatty material** build up inside the coronary arteries, narrowing them.
- This reduces the flow of blood through the coronary arteries, so the heart muscle gets less oxygen for respiration. If an artery becomes blocked, part of the heart muscle can be damaged or die (a heart attack).

Treating CHD

- **Stents** are small mesh tubes placed inside a narrowed coronary artery to keep it open. Advantages: blood flow improves straight away, only a minor operation, quick recovery. Disadvantages: risks of the procedure (e.g. infection or a blood clot forming), and the artery can narrow again.



Coronary heart disease and a stent. The arrows show blood flow.

- **Statins** are drugs that reduce blood cholesterol levels, which slows down the rate at which fatty material is deposited. Advantages: no surgery; they reduce the risk of CHD developing or getting worse. Disadvantages: they must be taken regularly for a long time, take time to work and can have side effects.

Faulty valves and heart failure

- A heart valve may become faulty: it may not open fully, or it may leak. The heart then pumps blood less efficiently, so the person can become tired and breathless.
- Faulty valves can be replaced with **biological valves** (from animals or human donors) or **mechanical valves**. Mechanical valves last longer, but the patient must take drugs for life to stop blood clots forming.
- In heart failure, a **donor heart**, or heart and lungs, can be transplanted. Problems: a shortage of donors, major surgery, and the risk of rejection, so the patient must take immunosuppressant drugs for life.
- **Artificial hearts** are occasionally used to keep a patient alive while waiting for a transplant, or to let the heart rest as an aid to recovery. They are less likely to be rejected, but there is a risk of blood clots and infection, and parts can fail.

How to answer each type of question

Explain how CHD affects the heart 3 marks **Grade 5**

1. Fatty material builds up in the coronary arteries.
2. The arteries narrow, so less blood flows through them to the heart muscle.
3. So the heart muscle gets less oxygen for respiration (and may be damaged or die).

Example. Explain how coronary heart disease can damage the heart muscle.

Model answer. Layers of fatty material build up inside the coronary arteries (1). This narrows the arteries, so less blood flows to the heart muscle (1). The heart muscle cells get less oxygen, so they cannot respire aerobically enough / part of the muscle may die (1).

Describe how a treatment works

2 to 4 marks **Grade 5**

1. Say what the treatment is or where it goes.
2. Say what it does to the blood flow or to the fatty build-up.

Example. (a) Describe how a stent helps a person with coronary heart disease.
(b) Describe how statins reduce the risk of coronary heart disease.

Model answer.

(a) The stent is placed inside the narrowed coronary artery (1) and holds it open, so more blood flows to the heart muscle (1).

(b) Statins lower blood cholesterol (1), which slows down the build-up of fatty material in the arteries (1).

Explain the consequences of a faulty valve

2 to 3 marks **Grade 6**

1. Say what goes wrong: blood leaks backwards, or the valve does not open fully.
2. Link it to less blood being pumped out of the heart.
3. Finish with less oxygen reaching the body cells for respiration.

Example. One of the valves in a patient's heart leaks.
Explain why this patient gets tired and out of breath easily.

Model answer. Blood flows backwards through the leaking valve (1), so less blood is pumped out of the heart with each beat (1). Less oxygen is delivered to the muscles for respiration (1).

6-mark: evaluate treatments for heart disease

6 marks **Grade 7**

1. Give advantages and disadvantages of each treatment named.
2. Think about: how quickly it works, how long it lasts, surgery risks, side effects, lifelong drugs, cost, donor availability.
3. Compare the treatments directly, using words such as 'whereas' and 'however'.
4. Finish with a conclusion that is justified and fits the patient described.

Example. A patient has a narrowed coronary artery. The doctor offers either a stent or a course of statins.
Evaluate these two treatments for this patient.

Model answer.

Marked in levels. Points could include:

Stent: works immediately, restoring blood flow; quick recovery; lasts a long time; but it needs an operation, with a risk of infection or blood clots, and the artery may narrow again.

Statins: no operation; slow the build-up of fatty material in all arteries; but must be taken every day for a long time, take time to work, may have side effects, and do not widen the artery that is already narrow.

Conclusion, e.g. a stent is better if the artery is badly narrowed because it works at once, and statins could be used as well to slow further build-up.

Level 3 (5 to 6 marks): advantages and disadvantages of both treatments, compared, with a justified conclusion. Level 2 (3 to 4 marks): advantages and disadvantages of both, or a conclusion that is only partly justified. Level 1 (1 to 2 marks): simple points about one or both treatments.

Don’t lose marks

- Saying the fatty material builds up in the heart or in veins. It builds up inside the coronary arteries.
- Saying the heart has less blood 'to pump'. The problem is less blood (and oxygen) reaching the heart muscle itself.
- Saying statins remove fat from the arteries. They lower blood cholesterol, which slows the build-up.
- In 'evaluate' questions, giving only advantages, or giving no conclusion.
- Saying artificial hearts are the normal long-term treatment. They are only occasionally used, usually for a limited time.

More tips

Memory tricks

- CHD chain: fat → narrow → less blood → less oxygen → less respiration. Each arrow is worth a mark.
- Stent = Scaffold (holds the artery open). Statin = Slows (the fatty build-up, by lowering cholesterol).
- For every treatment, think RISC: Risks (surgery, clots, infection), Improvement (how fast, how long), Side effects or lifelong drugs, Cost and availability.

Exam technique

- 'Evaluate' means give advantages and disadvantages, then a judgement with a reason.
- Use any data in the question (costs, success rates, waiting times) in your evaluation, quoting the numbers.
- Write 'coronary arteries', not just 'arteries' or 'blood vessels', in CHD answers.
- Write 'less oxygen for respiration' to link reduced blood flow to damage to the heart muscle.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3

Name the vessels that supply heart muscle
The coronary arteries supply the heart muscle with oxygenated blood.

Grade 4

Describe what happens in coronary heart disease
Layers of fatty material build up inside the coronary arteries and narrow them.

Grade 5

Describe how stents and statins treat CHD
A stent holds the coronary artery open; statins lower blood cholesterol, which slows the build-up of fatty material.

Grade 5

Describe treatments for faulty valves and heart failure
Faulty valves are replaced with biological or mechanical valves; heart failure can be treated with a donor heart (or heart and lungs) or, occasionally, an artificial heart.

Grade 5

Explain how CHD damages the heart muscle
Less blood flows through the narrowed coronary arteries, so the heart muscle gets less oxygen for respiration.

Grade 5

Evaluate drugs, devices and transplants
Weigh up how well and how quickly each works, risks, side effects, recovery, cost and the need for donors or lifelong drugs, then give a justified conclusion.

Grade 6

Explain the consequences of a faulty valve
A valve that does not open fully or that leaks makes the heart pump blood less efficiently, so less oxygen reaches the body.

Free notes, Full packs, practice papers and mock exams at chhetriacademy.com. Written for this site; not taken from past papers. Stuck? 1-to-1 tutoring with a free 30-minute trial lesson.