1.13 The Circulatory System and Heart: 30-minute Pack

AQA 8464 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Cardiac output is the volume of blood pumped by one ventricle of the heart in one minute. It can be calculated using the equation:
cardiac output = heart rate x stroke volume
(stroke volume is the volume of blood pumped out of a ventricle with each heartbeat)

(a) At rest, a man called Jamal has a heart rate of 72 beats per minute (bpm) and a stroke volume of 70 cm^3. Calculate his cardiac output at rest, in cm^3 per minute. **(2)**

.....

(b) Convert your answer to part (a) into dm^3 per minute. **(1)**

.....

(c) During exercise, Jamal's heart rate increases to 150 bpm and his stroke volume increases to 100 cm^3. Calculate his cardiac output during exercise, in dm^3 per minute. **(2)**

.....

(d) Calculate the percentage increase in Jamal's cardiac output from resting to exercise, using your answers to parts (a) and (c). **(3)**

.....

(Total for Question 1 is 8 marks)

© Revision Library | revisionlibrary.co.uk

2 Coronary heart disease (CHD) develops when the coronary arteries become narrowed.

(a) Name the blood vessels that supply the heart muscle itself with oxygen and glucose. **(1)**

(b) Explain how narrowed coronary arteries can lead to a heart attack. **(3)**

(c) State one lifestyle risk factor for developing coronary heart disease. **(1)**

(Total for Question 2 is 5 marks)

© Revision Library | revisionlibrary.co.uk

3 Coronary heart disease can be treated using stents or statins.

(a) Describe how a stent works to treat a narrowed coronary artery. **(2)**

(b) Explain how statins help to reduce the risk of coronary heart disease. **(2)**

(c) Evaluate one advantage and one disadvantage of treating coronary heart disease with a stent, compared with using statins. **(2)**

(Total for Question 3 is 6 marks)

4 Discuss how these lifestyle factors are linked to the risk of developing coronary heart disease, and evaluate how effective changing them is likely to be in reducing this risk.

(Total for Question 4 is 6 marks)

© Revision Library | revisionlibrary.co.uk

Mark scheme · 1.13 The Circulatory System and Heart: 30-minute Pack

Question 1

(a) 72 x 70, oe **M1**

(a) 5040 cm^3/min cao **A1**

(a) Answer: 5040 cm^3/min

(b) 5.04 dm^3/min, ft their (a) divided by 1000 **B1**

(b) Answer: 5.04 dm^3/min

(c) 150 x 100, oe **M1**

(c) 15 dm^3/min cao (allow 15000 cm^3/min) **A1**

(c) Answer: 15 dm^3/min

(d) increase = their (c) - their (a), in the same units, e.g. 15 - 5.04 = 9.96 dm^3/min, ft **M1**

(d) percentage increase = increase / their (a) x 100, oe, dependent on the M1 above **dM1**

(d) 197.6% (accept 198%), awrt **A1**

(d) Answer: 197.6% (approximately 198%) increase

Question 2

(a) coronary arteries **B1**

(a) Answer: Coronary arteries

(b) fatty deposits (plaque/atheroma) build up in the coronary arteries, narrowing them, oe **B1**

(b) this restricts/reduces the flow of blood, and so of oxygen and glucose, to the heart muscle, oe **B1**

(b) heart muscle cells may respire anaerobically or begin to die from a lack of oxygen, which can trigger a heart attack, oe **B1**

(b) Answer: Fatty deposits narrow the coronary arteries, reducing blood flow (and so oxygen and glucose) to the heart muscle; muscle cells can then be starved of oxygen and start to die, causing a heart attack.

(c) any one of: smoking / a diet high in saturated fat / lack of regular exercise / obesity / excessive alcohol consumption / high stress levels, oe **B1**

(c) Answer: E.g. smoking.

Question 3

(a) a stent is a small mesh tube that is inserted into the narrowed section of the artery, oe **B1**

(a) it is expanded and left in place to hold the artery open, allowing blood to flow through more easily, oe **B1**

(a) Answer: A stent is a mesh tube inserted into the narrowed artery and expanded to hold it open, so blood can flow through more easily.

(b) statins reduce the amount of 'bad' (LDL) cholesterol carried in the blood, oe **B1**

(b) this slows the rate at which fatty deposits build up in the arteries, reducing the risk of the arteries becoming (further) narrowed, oe **B1**

(b) Answer: Statins lower blood cholesterol, which slows the build-up of fatty deposits and so reduces the risk of arteries narrowing further.

(c) advantage, e.g. a stent widens the artery and improves blood flow immediately, whereas statins take time to lower cholesterol and reduce risk, oe **B1**

(c) disadvantage, e.g. fitting a stent requires surgery, which carries risks such as infection or bleeding, whereas statins are taken as a tablet and are non-invasive (though they can have side effects and must be taken long-term), oe **B1**

(c) Answer: Advantage: a stent has an immediate effect on blood flow, unlike statins which act gradually. Disadvantage: a stent requires invasive surgery with associated risks, whereas statins are non-invasive.

© Revision Library | revisionlibrary.co.uk

Question 4

Level 3 A detailed and coherent scientific account that links at least three lifestyle factors to the biological mechanisms that increase or decrease CHD risk (e.g. cholesterol, arterial damage, blood pressure), together with a well-reasoned evaluation of the effectiveness and limitations of lifestyle changes, logically structured throughout with sustained use of scientific terminology.	**5-6**
Level 2 Some scientifically correct description of how one or more lifestyle factors affect CHD risk, with a partial or limited evaluation of how effective changing them would be; ideas are not always well linked.	**3-4**
Level 1 Basic, undeveloped statements about lifestyle factors and/or CHD risk, with little or no explanation of the underlying biology and little or no evaluation.	**1-2**
Level 0 No relevant content.	**0**

Indicative content:

- A diet high in saturated fat raises the level of 'bad' (LDL) cholesterol in the blood.
- Raised cholesterol increases the rate at which fatty deposits (atheroma/plaque) build up inside the coronary arteries, narrowing them.
- Narrowed coronary arteries restrict blood flow to the heart muscle, increasing the risk of angina or a heart attack.
- Smoking damages the lining of the arteries, making fatty deposits more likely to build up, and carbon monoxide in cigarette smoke reduces the blood's oxygen-carrying capacity.
- Nicotine in cigarettes increases heart rate and blood pressure, increasing the strain on the heart and arteries.
- Lack of exercise and excessive alcohol consumption are linked to obesity and/or raised blood pressure, both of which increase the risk of CHD.
- Regular exercise strengthens the heart muscle, can lower resting heart rate and blood pressure, and helps maintain a healthy body weight, all reducing CHD risk.
- A balanced diet lower in saturated fat helps to keep blood cholesterol levels lower, slowing the build-up of fatty deposits.
- Not smoking prevents further damage to the arteries and allows some risk reduction over time.
- Evaluation: lifestyle changes can be very effective at reducing risk, but only if changes are sustained over the long term; some risk factors, such as age, sex, genetics and family history, cannot be changed by lifestyle alone, so risk cannot be eliminated completely, and medical treatments (e.g. statins, stents) may still be needed alongside lifestyle changes for people already at high risk.

© Revision Library | revisionlibrary.co.uk