Questions

Q1.

Explain why high blood pressure can increase the risk of developing cardiovascular disease (CVD).

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(Total for question = 3 marks)

Q2.

During the development of the mammalian heart, there is a hole between the left ventricle and the right ventricle.

This hole usually becomes sealed before the mammal is born. If it is not sealed, the mammal will become easily tired due to a lack of energy.

Explain why a mammal born with a hole between the two ventricles will have these symptoms.

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(Total for question = 3 marks)

Q3.

Diet is one factor that affects the development of CVD.

Explain how the diet of a person could affect the development of CVD.

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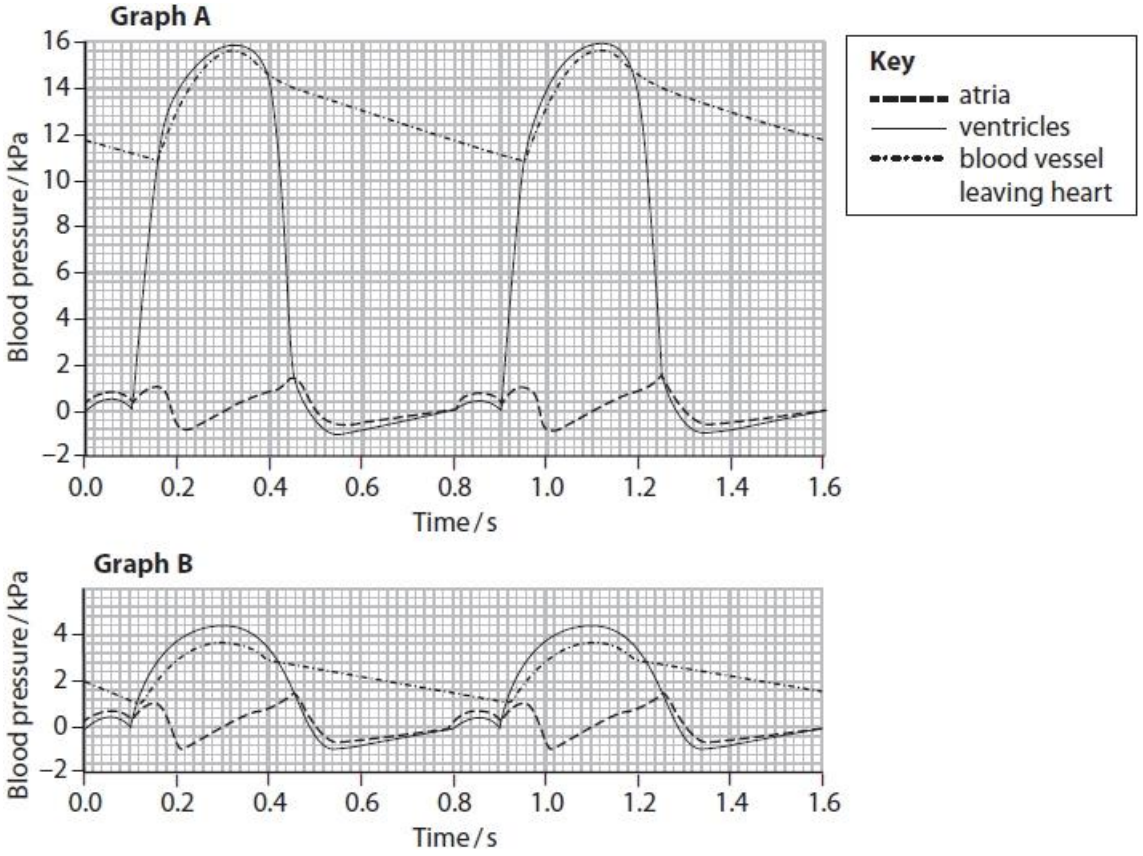
(Total for question = 4 marks)

Q4.

The pressure of the blood passing through the heart can vary.

Graph A shows the changes in blood pressure in one side of the heart. Graph B shows the changes in blood pressure in the other side of the heart over the same time period.



(i) Calculate the heart rate.

(2)

Answer .....

(ii) Increased heart rate is often associated with high blood pressure.

Which of the following will reduce blood pressure?

(1)

☒ **A** anticoagulants

☒ **B** antihypertensives

☒ **C** cholesterol

☒ **D** platelet inhibitors

(Total for question = 3 marks)

Q5.

Cardiovascular disease (CVD) is a major cause of death in developed countries.

A high body mass index (BMI) and diabetes are two risk factors for CVD.

Which of the following is another risk factor for CVD?

(1)

- ☒ **A** high blood pressure
- ☒ **B** low blood cholesterol
- ☒ **C** low salt intake
- ☒ **D** using statins

(Total for question = 1 mark)

Q6.

Cardiovascular disease (CVD) is a major cause of death and disability in the UK.

It has been suggested that magnesium ions are involved in regulating the ratio of HDL to LDL in the blood.

(i) Describe the role of LDLs in the development of atherosclerosis.

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(ii) Explain how atherosclerosis can result in damage to heart muscle.

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(Total for question = 6 marks)

Q7.

Thrombophilia is a condition that increases the risk of blood clots forming.

This condition increases the risk of venous thromboembolism (VTE), a condition where a blood clot forms in a vein. Thrombophilia due to the production of overactive factor V can be inherited.

Factor V is involved in the conversion of prothrombin to thrombin.

(i) Describe the role of thrombin in blood clotting.

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(ii) Explain why a mutation in the gene coding for the protein factor V may increase the risk of VTE.

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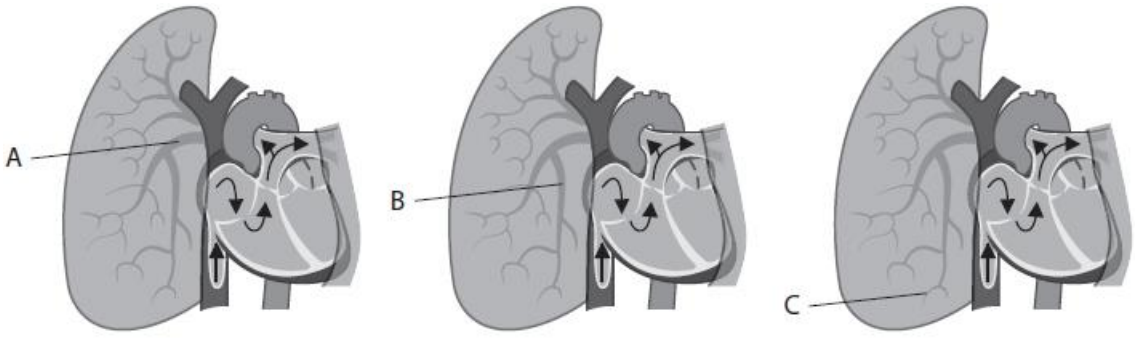
(Total for question = 6 marks)

Q8.

The location of a blood clot in the body can affect the oxygenation of the blood as well as the supply of oxygen to respiring tissues.

The diagrams show the location of three separate blood clots in arteries in the right lung.



The table shows the effect of the location of the blood clot on the percentage oxygen saturation of the blood leaving the right lung.

Location of blood clot	Blood oxygen saturation leaving the right lung (%)
A	84
B	92
C	98

(i) State why statin medication would not be an effective treatment for a blood clot in these arteries.

(1)

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(ii) Explain why the location of the blood clot would affect the oxygen saturation of the blood leaving the right lung.

(3)

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(Total for question = 4 marks)

Q9.

An ischaemic stroke occurs when a blood vessel in the brain is blocked by a blood clot.

Explain how a blood clot could form in a blood vessel.

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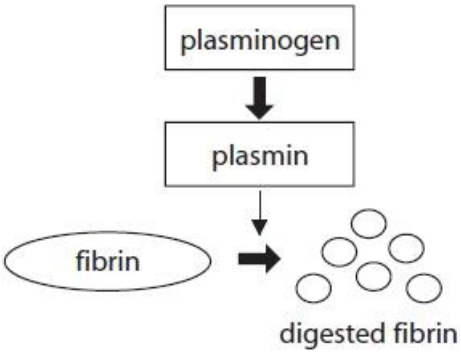
(Total for question = 4 marks)

Q10.

Plasmin is an enzyme that digests fibrin.

Plasmin is produced, in the blood, from an inactive form of the enzyme called plasminogen.



Pharmaceutical companies have developed drugs that inhibit the activity of plasmin.

One of these drugs, tranexamic acid, is used in surgery to reduce blood loss.

(a) Explain why tranexamic acid will result in reduced blood loss during surgery.

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(Total for question = 3 marks)

Q11.

Atherosclerosis is more likely to occur in arteries due to the higher blood pressure in these blood vessels.

A person with very high blood pressure has an increased risk of developing atherosclerosis.

(i) Describe how very high blood pressure could result in atherosclerosis.

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(ii) Explain how atherosclerosis in one part of an artery could increase the likelihood of it developing in another part of the same artery.

(2)

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(iii) A haemorrhagic stroke occurs when a blood vessel in the brain bursts.

Which of the following would be the least helpful in reducing damage from this type of stroke?

(1)

- ☒ **A** anticoagulant
- ☒ **B** antihypertensive
- ☒ **C** statins
- ☒ **D** thrombin

(Total for question = 6 marks)

Q12.

A heart attack may occur when a coronary artery is blocked with a blood clot. The risk of this can be reduced by treatment with platelet inhibitors.

Explain why platelet inhibitors would reduce the risk of a heart attack.

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(Total for question = 2 marks)

Q13.

It is possible to reduce the risk of CVD by taking medication or changing diet.

Explain the role of antihypertensive drugs in reducing the risk of atherosclerosis.

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(Total for question = 4 marks)

Q14.

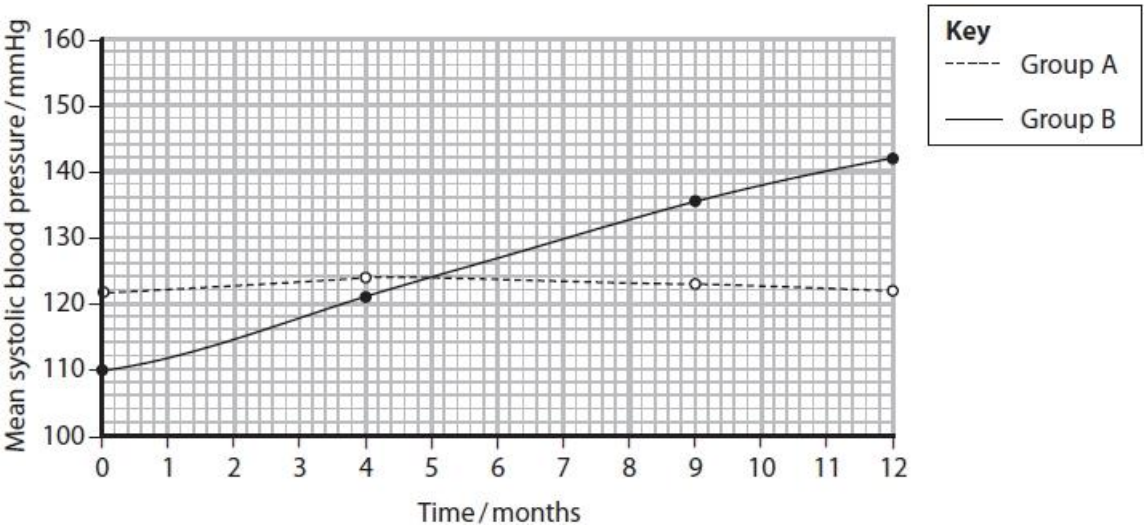
The effect of salt in the diet on blood pressure was investigated.

This investigation involved 15 males and 5 females, all between 20 and 30 years old. They were split into two groups, A and B, each of 10 people.

Group A had a diet containing 3 g of salt per day. Group B had a diet containing 9 g of salt per day.

The systolic blood pressures, measured in mmHg, were recorded during one year.

The results are shown in the graph.



A variety of drugs can be used to reduce blood pressure. These drugs may cause side effects in some people.

State **two** possible side effects of taking drugs to reduce blood pressure.

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(Total for question = 2 marks)

Q15.

Doctors sometimes prescribe beta-blockers for their patients.

Beta-blockers are a type of drug with antihypertensive properties.

Explain why beta-blockers are prescribed for some people.

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(Total for question = 2 marks)

Q16.

Cardiovascular disease (CVD) is a major cause of death.

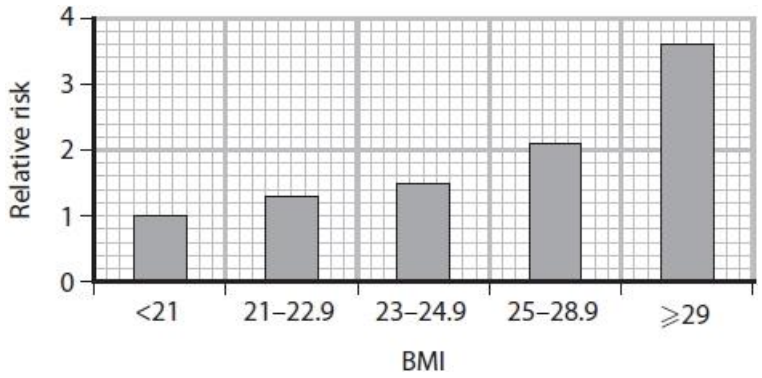
Obesity and high blood pressure are two risk factors for CVD.

One way of determining if a person is obese is to calculate their body mass index (BMI).

BMI is calculated using the following formula.

$$\text{Body mass index (BMI)} = \frac{\text{mass (kg)}}{\text{height (m)}^2}$$

The graph shows the relationship between BMI and the relative risk of developing CVD.



(i) Determine the relative risk of developing CVD for a person with a height of 1.54 m and a mass of 61 kg.

(2)

Answer .....

(ii) State another method that could be used to determine if a person is obese.

(1)

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(iii) Describe how high blood pressure could be reduced by medication and lifestyle changes.

(3)

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(Total for question = 6 marks)

Q17.

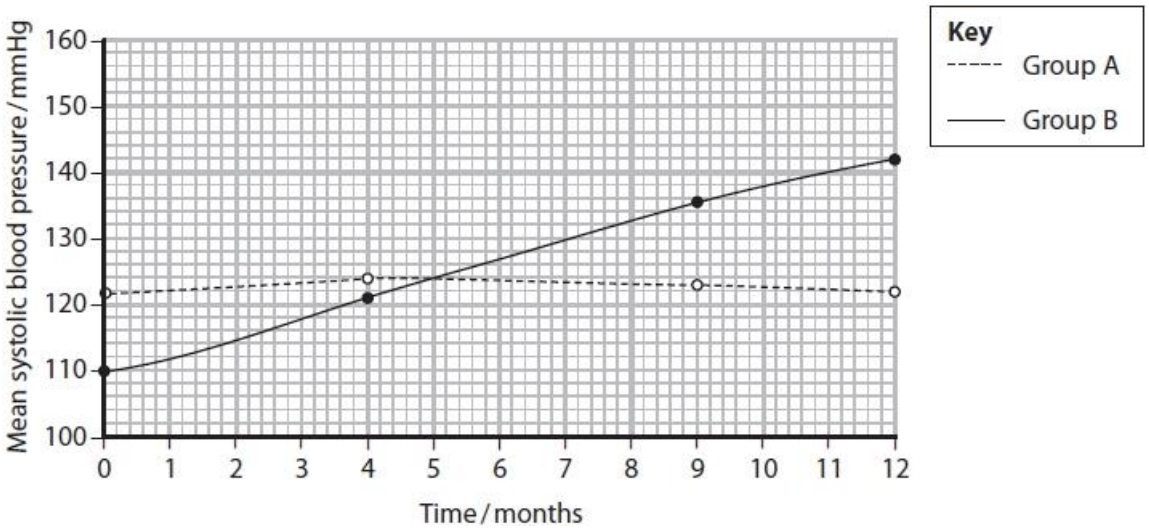
The effect of salt in the diet on blood pressure was investigated.

This investigation involved 15 males and 5 females, all between 20 and 30 years old. They were split into two groups, A and B, each of 10 people.

Group A had a diet containing 3 g of salt per day. Group B had a diet containing 9 g of salt per day.

The systolic blood pressures, measured in mmHg, were recorded during one year.

The results are shown in the graph.



(i) Determine the effects of salt in the diet on systolic blood pressure in this investigation.

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(ii) Explain the effect that a diet high in salt could have on a person's risk of developing cardiovascular disease.

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(Total for question = 8 marks)

Mark Scheme

Q1.

Question Number	Answer	Additional guidance	Mark
	An explanation that makes reference to the following • high blood pressure causes damage to the endothelium ofthe arteries (1) • inflammatory response / build-up of cholesterol leads tothe formation of an atheroma (1) • plaque develops and narrows the lumen of the artery (1)		**(3)**

Q2.

Question Number	Answer	Additional guidance	Mark
	An explanation that makes reference to three of the following: • less oxygen available for aerobic respiration (1) • deoxygenated blood mixes with oxygenated blood (1) • therefore reducing the concentration of oxygen in the bloodcirculating in the body (1) • because some deoxygenated blood {does not leave right ventricle / is transferred to the left ventricle / does not go to thelungs / goes to the respiring tissues} (1)	ALLOW lack of oxygen leads to (some) anaerobic respiration ALLOW some oxygenated blood {does not leave left ventricle / is transferred to the right ventricle / does not go to the respiring tissues / goes to the lungs}	**(3)**

Q3.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to four of the following: • high(er) salt intake (1) • (which) increases blood pressure (1) • high blood pressure causes damage to endothelium (of artery) (1) • high intake of {cholesterol / saturated fat} (1) • high {LDL's / saturated fat} linked to {atheroma / plaque formation} (1)		(4)

Q4.

Question Number	Answer	Additional Guidance	Mark
(i)	• correct figures from graph • correct answer with unit	Example of calculation e.g. 120 and 1.6 or 60 and 0.8 120 ÷ 1.6 / 60 ÷ 0.8 75 bpm	(2)

Question Number	Answer	Mark
(ii)	***The only correct answer is B as antihypertensives lower blood pressure*** ***A*** *is not correct because anticoagulants do not reduce blood pressure* ***C*** *is not correct because cholesterol does not reduce blood pressure* ***D*** *is not correct because platelet inhibitors do not reduce blood pressure*	(1)

Q5.

Question Number	Answer	Additional Guidance	Mark
	A – high blood pressure		(1)

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Q6.

Question Number	Answer	Additional Guidance	Mark
(i)	A description that makes reference to the following: • (LDL / lipoproteins carry) cholesterol in the blood • (cholesterol) is deposited to form atheroma (1) • in the endothelium of an artery	ALLOW LDLs increase blood cholesterol ALLOW plaque formation ALLOW artery wall	**(3)**

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to the following: • narrowing of (lumen of) coronary arteries • which reduces {blood flow / oxygen} to the cardiac muscle • which reduces aerobic respiration	ALLOW coronary arteries blocked ALLOW heart muscle ALLOW more anaerobic respiration / build- up of lactic acid	**(3)**

Q7.

Question Number	Answer	Additional guidance	Mark
(i)	A description that makes reference to the following: • thrombin is an enzyme (1) • (which catalyses) the conversion of fibrinogen into fibrin (1) • a mesh of fibrin traps { platelets / red blood cells } to form a clot (1)	IGNORE 'platelet plug'	**(3)**

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation that makes reference to the following: • (mutation in the gene) changes the sequence of the amino acids (in the factor V molecule) (1) • (overactive factor V will) increase the production of thrombin (1) • increases blood clotting (1)	ALLOW the mutation results in a change to the {primary structure/ polypeptide chain} ALLOW increased risk of blood clotting	**(3)**

Q8.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer that makes reference to the following: • statins do not break down blood clots	ALLOW statins lower LDL / blood cholesterol / risk of a blood clot	**(1)**

Question Number	Answer	Additional Guidance	Mark
(ii)	A explanation that makes reference to three of the following: • if the blood clot is at {A / larger artery} it will result in the largest reduction in blood oxygen saturation (1) • because it would result in reduced blood flow (in the lung) (1) • this would result in reduced gas exchange (1) • (therefore) fewer red blood cells can be oxygenated (1)	ALLOW converse for {C / smaller artery} ALLOW less blood can be oxygenated	**(3)**

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Q9.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • collagen is exposed when wall of blood vessel is damaged (1) plus any three from the following • leading to release of thromboplastin (1) • (thromboplastin catalyses) conversion of prothrombin to thrombin (1) • (thrombin catalyses) conversion of fibrinogen to fibrin (1) • fibrin forms a mesh of fibres and traps (red) blood cells (to form a clot) (1)	ALLOW damage to endothelium exposes collagen ALLOW platelets release thromboplastin	(4)

Q10.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • fibrin forms a mesh that collects {platelets / red blood cells} • (tranexamic acid) { prevents plasmin digesting fibrin / stops the breakdown of fibrin } • allowing clots to remain in place	ALLOW fibrin is involved in forming blood clots	(3)

Q11.

Question Number	Answer	Additional Guidance	Mark
(i)	A description that makes reference to three of the following: • (high blood pressure) damages the endothelium of the artery (1) • causing an inflammatory response (1) • {white blood cells / cholesterol} accumulate / atheroma forms (1) • calcium salts and fibrous tissue build up / formation of a plaque (1)		(3)

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to the following: • {plaques / atherosclerosis} narrow the lumen (1) • increasing blood pressure (further) (1)	ALLOW narrowing of artery ALLOW atheroma	(2)

Question Number	Answer	Mark
(iii)	**The only correct answer is A - anticoagulant** ***B*** *is not correct because antihypertensives would reduce the blood pressure and reduce damage from a haemorrhagic stroke* ***C*** *is not correct because statins would not have an immediate effect* ***D*** *is not correct because thrombin would aid blood clotting and reduce damage from a haemorrhagic stroke*	(1)

Q12.

Question Number	Answer	Additional guidance	Mark
	An explanation which makes reference to the following: • (platelet inhibitors) reduce the risk of blood clots forming (1) • therefore less likely that {coronary arteries / blood flow to heart muscle} will be blocked (1)	ALLOW prevent platelets {aggregating becoming sticky}/ prevent clotting cascade	(2)

Q13.

Question Number	Answer	Additional Guidance	Mark
	An explanation which includes reference to the following: • antihypertensive drugs lower blood pressure (1) • lower blood pressure reduces risk of damage to endothelium of the artery (1) • reduced risk of inflammatory response (1) • reduced risk of { atheroma / plaque } formation (1)	Accept converse argument for marking points 2, 3 and 4 Ignore epithelium Allow description of an inflammatory response	**(4)**

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Q14.

Question Number	Answer	Additional Guidance	Mark
	An answer which makes reference to two of the following: • nausea (1) • muscle cramps (1) • dizziness / fainting / hypotension (1) • kidney failure (1)	ALLOW other correct side effects of antihypertensives if not listed IGNORE references to anticoagulants, platelet inhibitors and statins ALLOW vomiting	**(2)**

Q15.

Question number	Answer	Additional guidance	Mark
	An explanation that makes reference to the following: • beta-blockers reduce blood pressure (1) • therefore reducing the risk of {atherosclerosis / heart disease /CVD} (1)	ALLOW prescribed to people with {highblood pressure / irregular heart beat / anxiety} ALLOW because high blood pressure can {cause atherosclerosis / damage the endothelium} ALLOW heart attack	(2)

Q16.

Question Number	Answer	Additional guidance	Mark
(i)	• correct BMI calculated (1) • correct risk determined from graph (1)	Example of calculation $(61 \div 1.54^2) = 25.72$ Relative risk = 2.1 Correct risk with no working scores full marks	(2)

Question Number	Answer	Additional guidance	Mark
(ii)	• waist to hip ratio / waist:hip		(1)

Question Number	Answer	Additional guidance	Mark
(iii)	A description which makes reference to the following: • treatment with antihypertensive medication (1) plus any two relevant lifestyle changes: • reduce salt intake (1) • stop smoking (1) • increase exercise (1) • reduce weight (1)	ALLOW named example e.g. ACE inhibitor/ calcium channel blocker / diuretic / beta blocker	(3)

Q17.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer which makes reference to the following: • {no increase / little change } in blood pressure for {low salt diet / 3g salt / group A} (1) • {high salt diet / 9g salt / group B }increased blood pressure (1) • data manipulation to show how much blood pressure increased by (1)	e.g. an overall increase for B of 32 mmHg / 20 mmHg higher than A / 29% increase for B / at 4 months group A is 2.5% higher	(3)

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation which makes reference to five of the following: • (diet high in salt) increases risk of CVD (1) • (high salt intake causes) higher blood pressure (1) • (which increases risk of) { damage to endothelium of artery / atherosclerosis } (1) • (therefore increases risk of) inflammatory response (1) • (leading to increased risk of) { atheroma / plaque formation } (1) • narrowing of arteries { increases risk of blood clots / increases blood pressure / reduces blood flow to cardiac muscle } (1)	ALLOW increases risk of heart attack / stroke	(5)