Risk, Diet and Health Data (Topic 1): Edexcel SNAB A Level Biology Exam Questions by Topic

20 questions · 56 marks · about 67 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · AS Paper 1 · November 2021 · Q2(b) · 4 marks

(b) Diet is one factor that affects the development of CVD.

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

(4)

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Question 2 · information from earlier in the question

(b) During the early stages of DPN, individuals suffer from nerve pain.

Eventually, the damage results in nerves dying and complete loss of sensation.

Several factors have been linked to an increased risk of DPN in individuals with diabetes.

The table lists some of these risk factors for DPN.

Risk factor	Increase in risk (%)
High triglycerides	100
Smoking	42
High LDL to HDL ratio	67

Question 2 · A level Paper 3 · June 2023 · Q5(b)(ii) · 3 marks

(ii) Explain why these risk factors can cause peripheral nerve cells to die.

(3)

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Question 3 · AS Paper 1 · June 2024 · Q7(b)(i) · 2 marks

(b) One risk factor for coronary heart disease (CHD) is obesity.

The table shows the incidence of CHD for people with a differing number of risk factors.

Number of risk factors	Incidence of CHD per 100 000 people
0	60
1	130
2	210
3	615

(i) Describe the relationship between the number of additional risk factors and the incidence of CHD.

(2)

Question 4 · AS Paper 1 · June 2025 · Q4(c) · 1 mark

(c) Vitamin C is an antioxidant.

Some studies have discovered a negative correlation between vitamin C intake and the risk of coronary heart disease.

State what is meant by a negative correlation between vitamin C intake and the risk of coronary heart disease.

(1)

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Question 5 · A level Paper 2 · June 2024 · Q5(b)(i) · 1 mark

(b) Some people with high blood pressure have a 100% increased risk of developing CVD.

(i) State what is meant by a 100% increased risk.

(1)

Question 6 · A level Paper 1 · June 2017 · Q6(b)(i) · 3 marks

(b) The table shows the results of an investigation into the fibrinogen concentrations in the blood of males and females with and without cardiovascular disease (CVD).

	Mean fibrinogen concentration / mg 100 cm^{-3}	
	With CVD	**Without CVD**
Males	333 ± 5.16	322 ± 2.00
Females	336 ± 7.25	319 ± 1.89

(i) Explain how the results of this investigation could be used to identify individuals at risk of CVD.

(3)

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Question 7 · information from earlier in the question

8 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.

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(b) A study was carried out to determine the incidence of VTE in people of different ages. Those who developed VTE were then tested for the factor V gene mutation.

The results of this study are shown in the table.

Age range	Percentage incidence of VTE in the study group (%)	Percentage of VTE patients with factor V mutation in the study group (%)
less than 20 years of age	1.3	49.3
over 70 years of age	34.0	20.9

Deduce the relative impact of the genotype and environmental factors on the development of VTE.

(4)

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5 Blood clotting is a process that is affected by genes.

Some people are at an increased risk of a condition called deep vein thrombosis (DVT). Blood clots form in the veins of people with DVT.

There are two alleles in a population, a wild type allele and G20210A.

(a) The table shows the risk of DVT for people with different genotypes in this population.

Genotype	Risk of DVT / number of people with DVT per 1000 individuals
Homozygous wild type	1.0
Heterozygous for G20210A	2.5
Homozygous for G20210A	20.0

(i) Determine the effect of the allele G20210A on the risk of an individual developing DVT in this population.

(2)

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(b) The Million Women Study was set up in 1996 and considered aspects of the health of UK women.

Using data from this study, scientists investigated the effects of various factors on coronary heart disease (CHD).

The scientists selected one million women who had not had CHD before the study started.

The women provided information on the following:

- BMI
- smoking habits
- alcohol intake
- level of physical activity
- age at the start of the investigation.

The women were monitored for five years and the development of CHD was recorded. The data were used to estimate the likelihood of any woman developing CHD.

The table shows the effect of age and BMI on the development of CHD in women.

Age range /years	Percentage incidence of CHD over 5 years for different BMI values (%)			
	BMI 22.5	BMI 27.5	BMI 32.5	BMI 37.5
55–59	1.0	1.5	1.8	2.2
60–64	1.9	2.4	3.0	3.5
65–69	3.0	3.7	4.3	4.8
70–74	4.5	5.1	5.8	7.1

(i) Describe the effect of age and BMI on the development of CHD in women.

(2)

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3 Studies have provided evidence for a link between heart rate when a person is at rest and various medical conditions.

(a) In one study, the relationships between resting heart rate and the percentage incidence of coronary heart disease and cancer were investigated.

The results are shown in the table.

Range of resting heart rate / beats per min	Number of individuals in each range	Percentage incidence of condition (%)	
		Coronary heart disease	Cancer
< 59	961	4.2	1.0
60–69	2277	6.0	1.5
70–79	2120	7.5	2.0
80–89	1202	8.0	2.5
90–99	576	8.2	4.0
> 99	379	7.9	3.8

(i) Comment on the evidence for a link between resting heart rate and the percentage incidence of coronary heart disease and cancer.

(5)

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Question 11 · A level Paper 3 · June 2017 · Q3(a)(iii) · 2 marks

(iii) Give two reasons why the number of people in each resting heart rate group did not affect the validity of this investigation.

(2)

Question 12 · information from earlier in the question

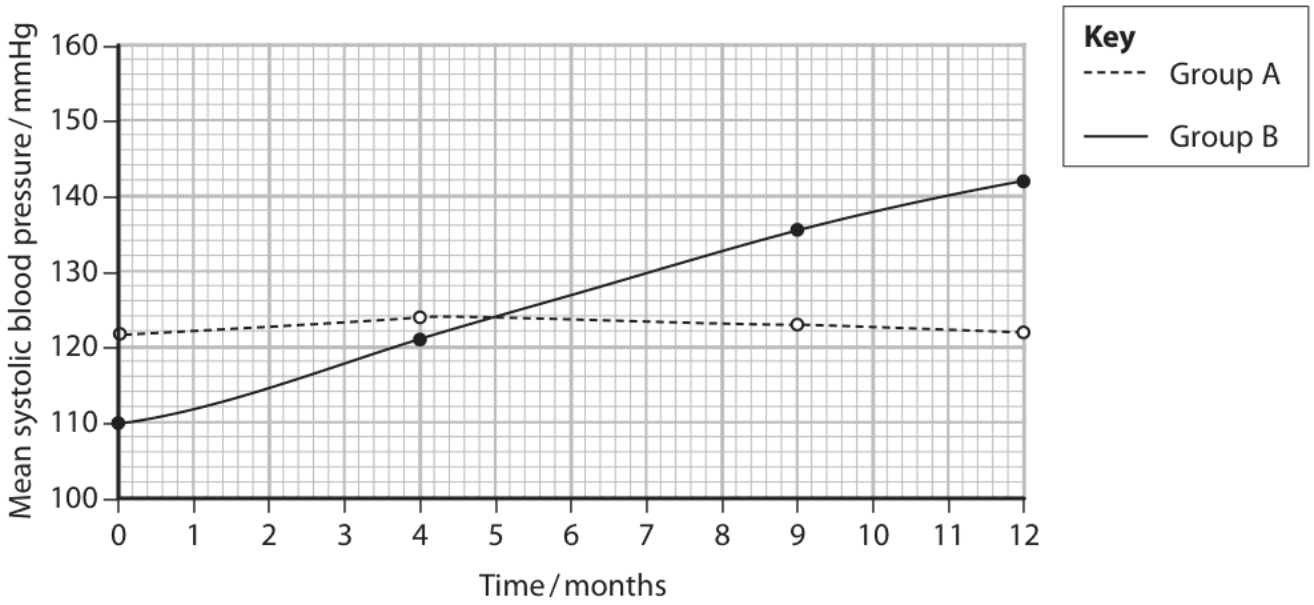
7 The effect of salt in the diet on blood pressure was investigated.

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.



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Question 12 · AS Paper 1 · June 2018 · Q7(b) · 3 marks

(b) Explain how the validity of this investigation could be improved.

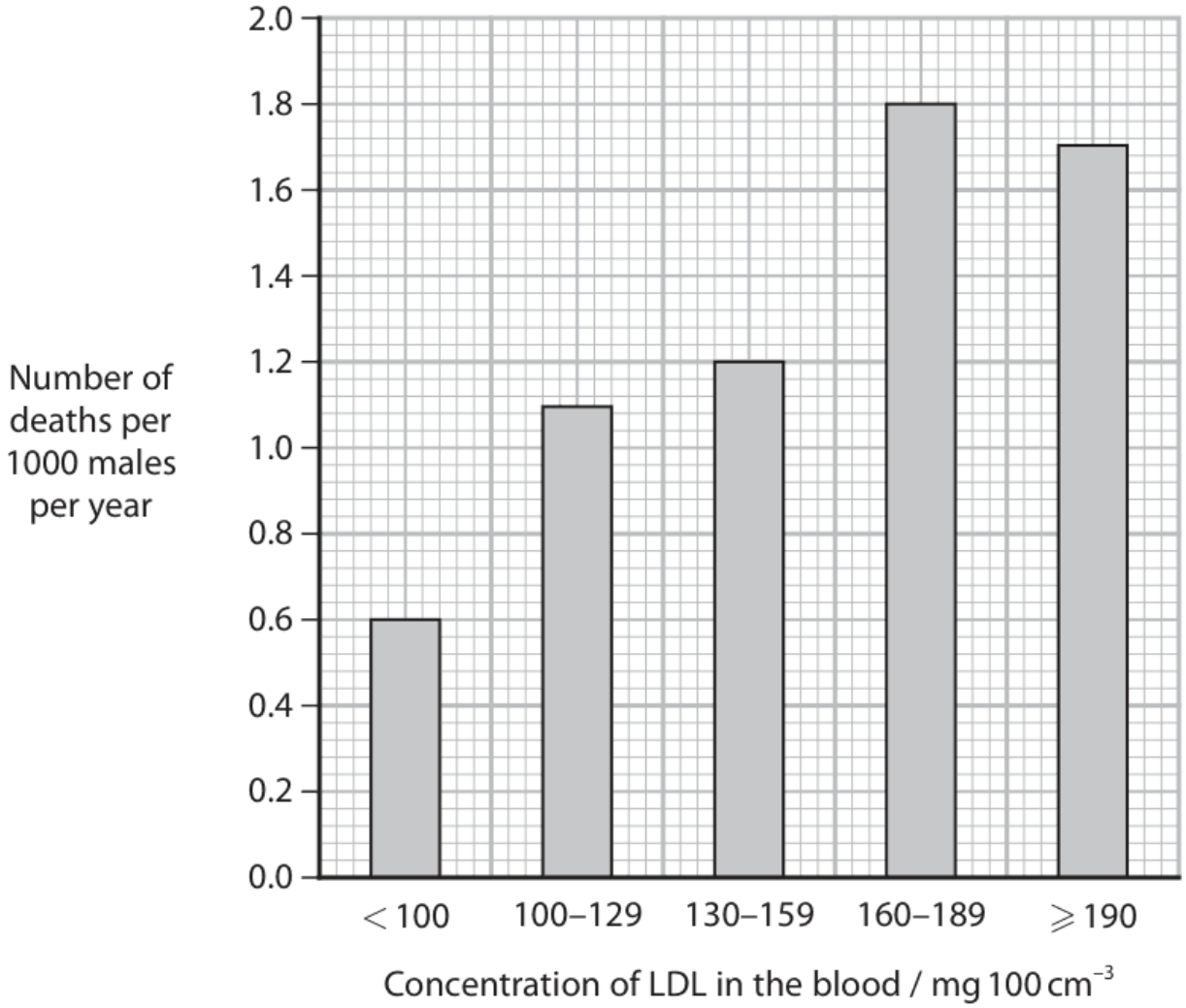
(3)

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(d) The concentration of LDL in the blood is a risk factor for cardiovascular disease (CVD).

The effect of LDL concentration in the blood on the number of deaths from CVD, in males aged from 25 to 40, was investigated.

The graph shows the results of this investigation.



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Question 13 · AS Paper 1 · June 2023 · Q7(d)(ii) · 4 marks

(ii) The UK population in 2021 was 68 269 157.

A student concluded that 81 923 people with an LDL concentration in the blood of 130–159 mg per 100 cm^3 died from CVD in 2021.

Comment on the validity of this conclusion.

Use the information in the graph to support your answer.

(4)

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4 Scientists studied how perception of risk differs from the actual risk.

People were asked to estimate their risk of developing cardiovascular disease (CVD) during their lifetime.

This gave their perceived risk.

The scientists used information gathered from questionnaires and various tests to calculate a predicted actual risk of developing CVD, for each person.

The table shows how the perceived risk given by each person was compared with the predicted actual risk calculated by the scientists.

Underestimation of lifetime risk for CVD	Correct estimation of lifetime risk for CVD	Overestimation of lifetime risk for CVD
Perceived risk < predicted actual risk	Perceived risk = predicted actual risk	Perceived risk > predicted actual risk

It was found that some people's perception of their lifetime risk of developing CVD was different from the predicted actual risk calculated by the scientists.

(a) Explain why the perception of the lifetime risk of developing CVD of some people was different from the predicted actual risk.

(4)

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Question 15 · AS Paper 1 · June 2019 · Q2(b) · 3 marks

(b) The incidence of obesity is increasing in some populations.

High levels of sugars, such as fructose, in processed food could be contributing to this increase.

Explain why high levels of sugars in a person's diet could lead to obesity.

(3)

Question 16 · information from earlier in the question

(c) The relationship between daily energy intake and body mass index (BMI) in adult females was investigated.

The body mass index was calculated for each female at the start and end of the investigation.

Three females starting with a BMI of 22.0 were given the same exercise plan.

Female 1 was given a diet containing 7560 kJ a day for a month.

Female 2 was given a diet containing 8400 kJ a day for a month.

Female 3 was given a diet containing 9240 kJ a day for a month.

The recommended daily energy intake for a human female is 8400 kJ a day.

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Question 16 · AS Paper 1 · June 2022 · Q3(c)(ii) · 2 marks

(ii) Explain what is likely to happen to the BMI values for the females in this investigation.

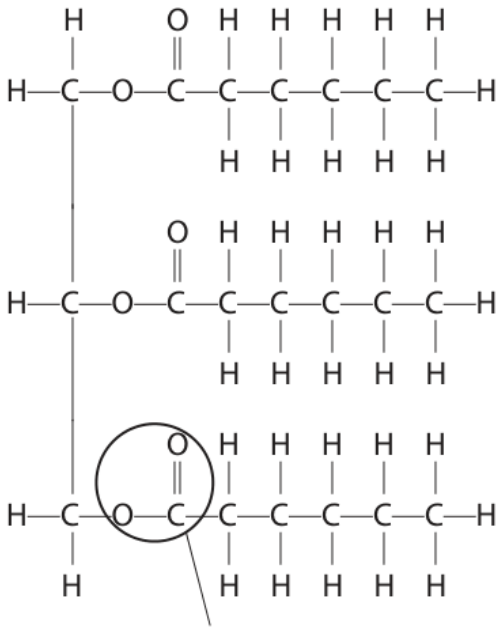
(2)

Question 17 · information from earlier in the question

6 Hydrolytic enzymes are released by organs in the digestive system.

(a) Cells in the pancreas and small intestine synthesise lipase. Lipase hydrolyses lipids in food.

The diagram shows a triglyceride molecule.



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Question 17 · AS Paper 1 · June 2016 · Q6(b) · 4 marks

(b) The triglyceride in the diagram can combine with protein to form a lipoprotein.

Explain the effect that large quantities of this lipoprotein would have on blood cholesterol levels.

(4)

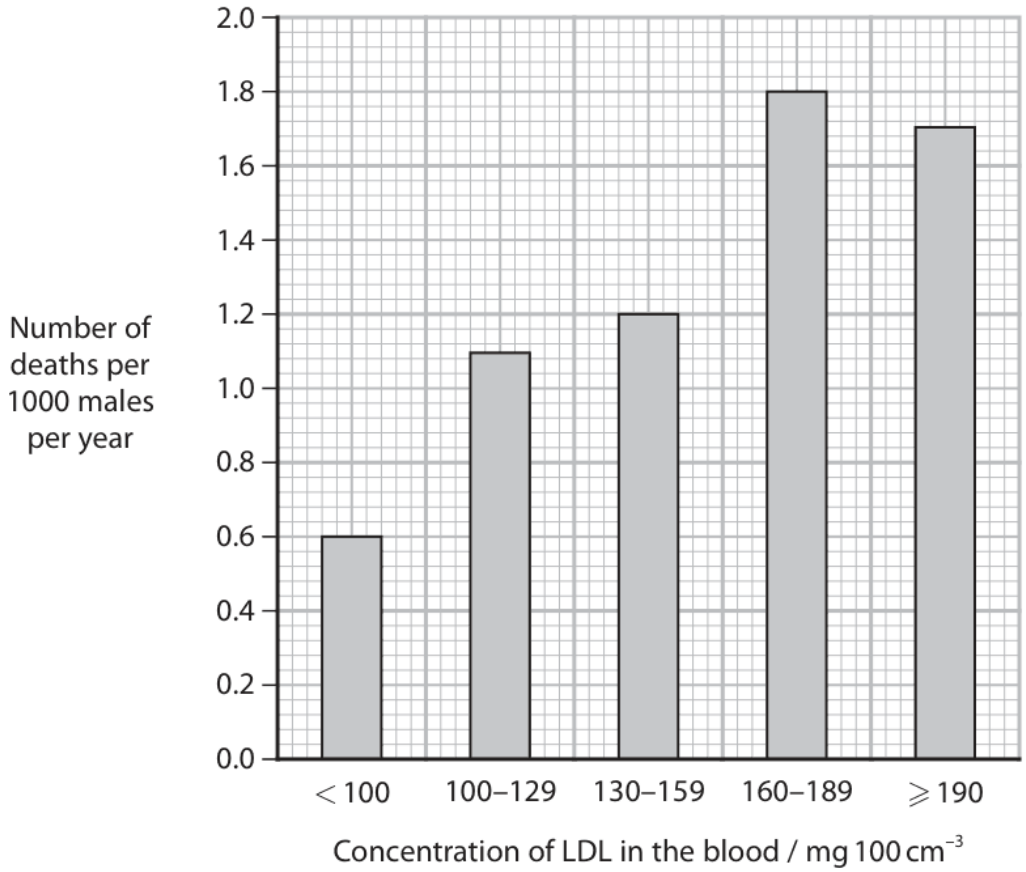
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Question 18 · AS Paper 1 · June 2023 · Q7(d)(i) · 2 marks

(d) The concentration of LDL in the blood is a risk factor for cardiovascular disease (CVD).

The effect of LDL concentration in the blood on the number of deaths from CVD, in males aged from 25 to 40, was investigated.

The graph shows the results of this investigation.



(i) Describe the relationship shown in the graph.

(2)

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Question 19 · AS Paper 1 · November 2021 · Q4(b) · 4 marks

(b) Explain how blood tests and obesity indicators can be used to collect data to predict the risk of developing CVD.

(4)

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Question 20 · information from earlier in the question

1 The photograph shows a young zebrafish that can be used to investigate the circulatory system. Zebrafish are vertebrates.



(a) The effect of caffeine on the heart rate of zebrafish was investigated.

A zebrafish was placed in water and observed using a microscope. The number of heartbeats in one minute was counted and the heart rate was recorded. This was repeated to give three measurements of heart rate.

The water was replaced with a caffeine solution and the heart rate was recorded. This was repeated to give three measurements of heart rate.

The results of the investigation are shown in the table.

Treatment	Heart rate / beats min^{-1}		
	Repeat 1	Repeat 2	Repeat 3
Water	124	120	112
Caffeine solution	184	172	156

Question 20 · AS Paper 1 · June 2017 · Q1(a)(iv) · 1 mark

(iv) Give **one** reason why a different ethical issue has to be considered when using zebrafish instead of *Daphnia* in this investigation.

(1)

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Mark schemes

Question 1 · AS Paper 1 · November 2021 · Q2(b) · 4 marks

Question Number	Answer	Additional Guidance	Mark
2 (b)	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)**

Question 2 · A level Paper 3 · June 2023 · Q5(b)(ii) · 3 marks

Question number	Answer
5(b)(ii)	An explanation that makes reference to the following: • relevant damage to cardiovascular system (1) • reduced {blood flow / oxygen supply / glucose supply} to (peripheral) nerves (1) • insufficient (aerobic) respiration takes place (so neurones die) (1)

Additional guidance	Mark
ALLOW reasonable examples e.g. development of atherosclerosis / atheroma / oedema / reduced gas exchange in lungs e.g. nerve cells do not receive enough oxygen for respiration gets MP2 and 3	(3)

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Question 3 · AS Paper 1 · June 2024 · Q7(b)(i) · 2 marks

Question Number	Answer
7(b)(i)	An answer that makes reference to the following: • as the number of risk factors increases so does the incidence of CHD / positive correlation (1) • non-linear increase / description of steeper increase in CHD incidence with each additional risk factor (1)

Additional Guidance	Mark
ignore correlation unqualified ignore not proportional ALLOW exponential	(2)

Question 4 · AS Paper 1 · June 2025 · Q4(c) · 1 mark

Question Number	Answer
4(c)	An answer that makes reference to the following • higher vitamin C intake lowers risk of coronary heart disease / risk of coronary heart disease increases as intake of vitamin C decreases

Additional Guidance	Mark
ALLOW CHD for coronary heart disease	(1)

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Question 5 · A level Paper 2 · June 2024 · Q5(b)(i) · 1 mark

Question Number	Answer
5(b)(i)	• twice as likely / doubles the likelihood (to develop CVD) (1)

Additional Guidance	Mark
ALLOW doubles / x 2 the risk	1

Question 6 · A level Paper 1 · June 2017 · Q6(b)(i) · 3 marks

Question Number	Answer
6(b)(i)	An explanation that makes reference to the following: • fibrinogen concentration is higher in individuals with CVD (1) • compare an individual's fibrinogen concentration with values in the table (1) • no overlap between fibrinogen concentrations for those with CVD compared with those without CVD (1)

Additional Guidance	Mark
ALLOW females above 321and males above 324 or females above 328 and males above 329 are identified as being at risk ALLOW values above mean without CVD + SD or mean with CVD –SD identified as at risk	3

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Question 7 · A level Paper 1 · June 2019 · Q8(b) · 4 marks

Question Number	Answer
8(b)	An answer that makes reference to the following: • percentage incidence (of VTE) higher in {older people /people older than 70 } (1) • in younger people larger percentage (of VTE patients) have the factor V mutation (1) • (therefore) genotype has a greater influence on incidence (of VTE) in younger people (1) • (therefore) greater incidence (of VTE) in older people probably a result of environmental factors (1)

Additional guidance	Mark
ALLOW converse – incidence of VTE lower in {younger people/ people under 20} ALLOW converse - lower percentage of older people have the factor V mutation ALLOW converse – genotype has less influence on incidence of VTE in older people	**(4)**

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Question 8 · A level Paper 3 · October 2020 · Q5(a)(i) · 2 marks

Question number	Answer
5(a)(i)	A description that makes reference to the following: • the allele (G20210A) increases the risk of suffering a deep vein thrombosis / two copies of the allele (G20210A) increases risk (1) • there is a { 2.5 fold increase in risk with one allele / 20 fold increase in risk with two alleles / 8-fold increase in risk with two alleles compared to one allele} (1)

Additional guidance	Mark
ALLOW abbreviations for G20210A ALLOW DVT IGNORE 1.5 x, 17.5 x and 19 x as these come from incorrect subtractions of risk factors	**(2)**

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Question 9 · A level Paper 2 · June 2023 · Q10(b)(i) · 2 marks

Question Number	Answer
10(b)(i)	A description that makes reference to two of the following: • increasing age increases incidence of CHD (1) • increasing BMI increases incidence of CHD (1) • greatest increase is due to increasing age (1)

Additional Guidance	Mark
	[2]

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Question 10 · A level Paper 3 · June 2017 · Q3(a)(i) · 5 marks

Question Number	Acceptable Answer
3(a)(i)	An answer that makes reference to the following: • as heart rate increases, so does incidence of {both conditions / CHD and cancer } **(1)** • relationship between heart rate and CHD quantified **(1)** • relationship between heart rate and cancer quantified **(1)** • greater increase in incidence of cancer with increased heart rate **(1)** • at a heart rate >99bpm there is a reduction in incidence of both conditions / plateaus / little difference **(1)**

Additional Guidance	Mark
ALLOW converse e.g. 1.95x increase up to 99 bpm / 1.88x increase at >99 e.g. 4.0x increase up to 99 bpm / 3.8x increase at >99 ALLOW converse	**(5)**

Question 11 · A level Paper 3 · June 2017 · Q3(a)(iii) · 2 marks

Question Number	Answer
3(a)(iii)	An answer that makes reference to two of the following: • still (statistically) a large sample size **(1)** • wide range of heart rates considered **(1)** • percentage incidence used (rather than number) **(1)**

Additional Guidance	Mark
	(2)

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Question 12 · AS Paper 1 · June 2018 · Q7(b) · 3 marks

Question Number	Answer
7(b)	An explanation which includes reference to the following: • equal numbers of males and females (1) • larger sample size (1) • named suitable controlled variable (1)

Additional Guidance	Mark
e.g. same starting blood pressure / body mass / diet / exercise level	(3)

Question 13 · AS Paper 1 · June 2023 · Q7(d)(ii) · 4 marks

Question Number	Answer
7(d)(ii)	An answer that makes reference to four of the following: • not valid (1) • as study was only carried out on {males / people aged 25-40} (1) • (therefore) not representative of UK population / cannot apply results to {females / other age groups} (1) • no idea of {sample size / duration} of study (1) • the deaths may have been caused by other factors (1)

Additional Guidance	Mark
ALLOW study does not include {females / ages other than 25-40}	(4)

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Question 14 · AS Paper 1 · November 2021 · Q4(a) · 4 marks

Question Number	Answer
4 (a)	An explanation that makes reference to four of the following: • some people's perception of lifetime risk was lower (than the predicted lifetime risk) (1) • due to inaccuracies in their reported intake of a dietary factor (1) • due to {underestimating / overestimating} a named factor (1) • lack of knowledge of family history (1) • lack of education on developing CVD (1)

Additional Guidance	Mark
ALLOW converse e.g. salt intake, HDL:LDL, cholesterol, alcohol intake e.g. BMI, waist:hip, blood pressure, number of cigarettes smoked, stress, exercise ALLOW converse ALLOW converse	**(4)**

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Question 15 · AS Paper 1 · June 2019 · Q2(b) · 3 marks

Question Number	Answer
2(b)	An explanation that makes reference to three of the following: • energy intake higher than energy output (1) • (excess) {energy / sugars} can be {stored as / converted to} fat (1) • leading to weight gain (greater than overweight) (1) • obesity as indicated by a {BMI above 30 / waist-hip ratio greater than 0.85 in women or 1.0 for men} (1)

Additional Guidance	Mark
ALLOW correct description of energy imbalance ALLOW increase in body mass	**(3)**

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Question 16 · AS Paper 1 · June 2022 · Q3(c)(ii) · 2 marks

Question Number	Answer
3(c)(ii)	An explanation that makes reference to the following: • the BMI of female 1 would decrease, the BMI of female 2 would stay the same and the BMI of female 3 would increase (1) • (because) excess energy intake would lead to an increase in {mass / BMI} / low energy intake would lead to a decrease in {mass / BMI} (1)

Additional Guidance	Mark
ALLOW positive correlation (between consistent daily energy intake and BMI)	**(2)**

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Question 17 · AS Paper 1 · June 2016 · Q6(b) · 4 marks

Question Number	Answer
6(b)	An explanation that makes reference to: • increased (blood) cholesterol (1) • (because) the triglyceride is saturated (1) • The lipoprotein is an LDL (1) And one of the following: • { lipoproteins / LDLs } transport cholesterol (1) • LDL binds to receptors (on cell surface membranes) / LDL accumulates in blood if receptors overloaded (1)

Additional Guidance	Mark
Do not allow reference to HDL Do not allow if answers also make reference to decreased cholesterol Allow saturated fatty acids	(4)

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Question 18 · AS Paper 1 · June 2023 · Q7(d)(i) · 2 marks

Question Number	Answer
7(d)(i)	A description that makes reference to the following: • the {incidence of mortality / number of deaths} increases as the LDL blood concentration increases (from <100 to 189) (1) • the {incidence of mortality / number of deaths} decreases as the LDL blood concentration increases **above {189/190}** (mg 100 cm^{-3}) (1)

Additional Guidance	Mark
ignore references to positive correlation ALLOW non-linear increase	**(2)**

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Question 19 · AS Paper 1 · November 2021 · Q4(b) · 4 marks

Question Number	Answer
4 (b)	A description that makes reference to the following: • blood test to measure {HDL and LDL / cholesterol} levels (1) • higher HDL:LDL decreases risk / high cholesterol increases risk (1) • measurement of {height and mass / waist and hip size} / calculation of {BMI / waist:hip} (1) • {BMI above 30 / waist:hip above 1} increases risk (1)

Additional Guidance	Mark
ALLOW correct BMI formula	**(4)**

Question 20 · AS Paper 1 · June 2017 · Q1(a)(iv) · 1 mark

Question Number	Answer	Additional Guidance	Mark
1(a)(iv)	An answer that makes reference to the following: • (zebrafish are) vertebrates therefore they are more likely to feel pain (1)	ACCEPT converse statement for *Daphnia*	**(1)**

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