

## Data Collection and Analysis - Mark Scheme

Q1.

Question Number	Acceptable Answer	Additional guidance	Mark
<b>(a)</b>	<p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>• because females smoke fewer cigarettes / inhale less (1)</li> <li>• because females smoke different lower tar cigarettes (1)</li> <li>• because smoke for fewer years /started smoking later (1)</li> </ul>		<b>(2)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>(b)</b>	Correlation shows an association or relationship but no causal link (1)		<b>(1)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>(c)</b>	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• nicotine stimulates adrenaline release which increases {heart rate / blood pressure} (1)</li> <li>• {high blood pressure / toxins} damages endothelium (1)</li> <li>• reference to {inflammatory response / plaque formation} (1)</li> </ul>		<b>(3)</b>

Question Number	Indicative content	
<b>*(d)</b>	<p>Answers will be credited according to candidates' deployment of knowledge and understanding of material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p>Candidates are expected to reach a decision/judgment on whether tobacco smoke is the primary cause of kidney cancer.</p> <ul style="list-style-type: none"> <li>• Idea that tobacco smoke is a risk factor for kidney cancer: carcinogens from tobacco smoke can travel in the bloodstream to the kidney and are taken up by kidney cells.</li> <li>• Carcinogens cause mutation of the DNA in the kidney cells, for example p53 gene, leading to uncontrolled mitosis, and tumour formation.</li> <li>• Idea of risk of kidney cancer correlating with more than one factor, not just smoking.</li> <li>• Linkage of environmental factors (e.g. diet, weight, alcohol consumption, age) to increased risk of cancer-causing mutations.</li> <li>• Inheritance of genetic mutations, and increased risk of cancer.</li> <li>• The requirement for studies to establish correlations and causal links.</li> </ul>	
Level	Mark	Descriptor
	0	No rewardable material
Level 1	1–3	<p>Demonstrates isolated elements of biological knowledge and understanding.</p> <p>Provides little or no reference to a range of scientific ideas, processes, techniques and procedures.</p> <p>Scientific argument may be attempted, but fails to link biological concepts and/or ideas in order to support decision/conclusion. Limited</p>
Level	Mark	Descriptor
Level 2	4–6	<p>Demonstrates adequate biological knowledge and understanding with selection of some biological facts/concepts to support the argument or decision/conclusion being made.</p> <p>Scientific reasoning occasionally supported through the linkage of a range of scientific ideas, processes, techniques and procedures.</p> <p>Scientific argument is partially developed. Attempts to synthesise and integrate relevant knowledge with linkages to biological concepts and/or ideas, leading to a notional scientific argument or decision/conclusion based on evidence.</p>
Level 3	7–9	<p>Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of biological facts/concepts to support the argument or decision/conclusion being made.</p> <p>Scientific reasoning supported throughout by sustained linkage of a range of scientific ideas, processes, techniques or procedures.</p> <p>Scientific argument is well developed and logical. Demonstrating throughout the skills of synthesising and integrating relevant knowledge with consistent linkages to biological concepts and/or ideas, leading to nuanced and balanced scientific argument or decision/conclusion based on evidence.</p>

Q2.

Question Number	Acceptable Answer	Additional guidance	Mark
<b>(a)</b>	<p>An explanation that makes reference to five of the following:</p> <ul style="list-style-type: none"> <li>at {low concentrations / up to 200 mg} there is a rapid increase in faecal fat content (1)</li> <li>drug binds to enzyme and alters the shape of the active site (1)</li> <li>drug acts as a non-competitive inhibitor (1)</li> <li>prevents enzyme {substrate / product} complex formation (1)</li> <li>prevents hydrolysis of {fat / triglyceride} (1)</li> <li>less fatty acids / glycerol absorbed (1)</li> <li>at {high concentrations / above 200 mg} there is a levelling at {25 to 30%} no further effect above 400 mg because all enzymes inhibited (1)</li> </ul>		<b>(5)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>(b)</b>	<p>An explanation that makes reference to four of the following:</p> <ul style="list-style-type: none"> <li>placebo used which allows for a comparison to ensure validity (1)</li> <li>error bars given which allow for indication of true mean (1)</li> <li>measurements taken for a long time to see if effects continued (1)</li> <li>more people used so reliability improved (1)</li> <li>measured the desired outcome (change in body mass) not an indirect measure (faecal fat) (1)</li> </ul>		<b>(4)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>(c)(i)</b>	$80 \div 31.25 = 0.032$ (1) height = $\sqrt{0.032}$ (1) = 1.6 m (1)		<b>(3)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>(c)(ii)</b>	BMI is calculated within a range on a scale of values / body mass is a definite value (1)		<b>(1)</b>

Question Number	Acceptable Answer	Additional guidance	Mark
<b>(c)(iii)</b>	<p>An explanation that makes reference to five of the following:</p> <ul style="list-style-type: none"> <li>• high blood pressure causes damage to endothelium (1)</li> <li>• atherosclerosis leads to narrowing of lumen of arteries (1)</li> <li>• heart disease as a result of narrowing of coronary arteries (1)</li> <li>• stroke as a result of reduced blood flow to brain (1)</li> <li>• joint damage caused by increased body mass leading to damage of the cartilage (1)</li> <li>• type 2 diabetes caused by reduced sensitivity of insulin receptors (1)</li> </ul>		<b>(5)</b>

Q3.

Question Number	Answer	Additional Guidance	Mark
<b>(a)</b>	Idea that the {increase / change} in relative risk of developing cirrhosis is {reflected / accompanied / eq} by the {increase / change} in alcohol consumption ;	ACCEPT 'the higher the consumption, the higher the risk' and similar IGNORE causation comments, it is positive	<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
<b>(b)(i)</b>	<ol style="list-style-type: none"> <li>1. both show an increase in risk with an increase in alcohol consumption / eq ;</li> <li>2. idea that the risk increases markedly at 30 g day<sup>-1</sup> in study A but at 40 g day<sup>-1</sup> in study B ;</li> <li>3. study A found the risk was higher than study B / eq ;</li> <li>4. credit use of comparative manipulated figures ;</li> </ol>	<p>ACCEPT mps to be pieced together</p> <p>IGNORE faster ACCEPT steeper</p> <p>3. ACCEPT for specified value of alcohol consumption or risk</p> <p>4. E.g. for 30g alcohol per day study A women have a relative risk 2 higher than study B women If units given they must be correct</p>	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
<b>(b)(ii)</b>	<p>Any <b>two</b> from differences in:</p> <p>age / diet / medication / other drug abuse / nationality / ethnicity / genetics / body mass / activity levels / other medical conditions / study method / sample size / {over / under / eq} estimation of consumption of alcohol / pattern of drinking (e.g. binge compared to regular/type of drink) ; ;</p>	<p>ACCEPT two correct answers in first section</p> <p>IGNORE environmental factors, lifestyle, occupation, pregnancy, ACCEPT smoking, weight, BMI, countries, regions, areas, metabolism, liver size</p>	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
(c)	<ol style="list-style-type: none"> <li>Each study found women to have a greater risk than men / eq ;</li> <li>idea that the risk increases markedly at 50 g day<sup>-1</sup> for men but at {30 /40 / both} g day<sup>-1</sup> for women ;</li> <li>idea that gradient of increased risk smaller for men than women (in both studies) ;</li> <li>credit correct use of figures e.g. above 42-44 g day<sup>-1</sup> men are at a lower risk / eq ;</li> </ol>		(2)

Question Number	Answer	Additional Guidance	Mark
(d)	<ol style="list-style-type: none"> <li>the results of both studies are (fairly) similar suggesting that the results are reliable / eq ;</li> <li>comments on the numbers of people in the studies / eq ;</li> <li>comment on lack of error bars / eq ;</li> <li>idea that the results do not reliably show at what level risk increases significantly ;</li> </ol>	<ol style="list-style-type: none"> <li>ACCEPT results show same pattern e.g. men lower than women in both studies</li> <li>E.g. we don't know the sample size. IGNORE number of studies</li> <li>ACCEPT no information about the range of results in each study</li> </ol>	(2)

Question Number	Answer	Additional Guidance	Mark
(e)	misreporting the amount of alcohol they had consumed / {did not know /guessed} the alcohol content of their drinks / used average values for alcohol content of drinks / {lost track of / could not remember } how much they drank / eq ;		(1)

Q4.

Question Number	Answer	Additional Guidance	Mark
	<p>An explanation which includes reference to the following:</p> <ul style="list-style-type: none"> <li>equal numbers of males and females (1)</li> <li>larger sample size (1)</li> <li>named suitable controlled variable (1)</li> </ul>	e.g. same starting blood pressure / body mass / diet / exercise level	(3)

Q5.

Question Number	Acceptable Answer	Additional Guidance	Mark
(i)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>as heart rate increases, so does incidence of {both conditions / CHD and cancer } (1)</li> <li>relationship between heart rate and CHD quantified (1)</li> <li>relationship between heart rate and cancer quantified (1)</li> <li>greater increase in incidence of cancer with increased heart rate (1)</li> <li>at a heart rate &gt;99bpm there is a reduction in incidence of both conditions / plateaus / little difference (1)</li> </ul>	<p>ALLOW converse</p> <p>e.g. 1.95x increase up to 99 bpm / 1.88x increase at &gt;99</p> <p>e.g. 4.0x increase up to 99 bpm / 3.8x increase at &gt;99</p> <p>ALLOW converse</p>	(5)

Q6.

Question Number	Answer	Additional Guidance	Mark
(ii)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>mid heart beat rate is more common in the (general) population / heart rate is normally distributed in the population (1)</li> <li>fewer people available at low and high heart rate because of other health risks (1)</li> </ul>	<p>ALLOW high and low heart rates are less common</p>	(2)

Question Number	Answer	Additional Guidance	Mark
(iii)	<p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>still (statistically) a large sample size (1)</li> <li>wide range of heart rates considered (1)</li> <li>percentage incidence used (rather than number) (1)</li> </ul>		(2)

Question Number	Answer	Mark
(i)	<p><b>D</b> – is correlated with a reduction in CVD</p> <p><i>The only correct answer is <b>D</b></i></p> <p><b>A</b> is not correct because the incidence of CVD decreases with increasing magnesium ion intake and it is not possible to infer causation from the data</p> <p><b>B</b> is not correct because it is not possible to infer causation from the data in graph</p> <p><b>C</b> is not correct because the incidence of CVD decreases with increasing magnesium ion intake</p>	(1)

Question Number	Answer	Mark
(ii)	<p><b>B</b> – 78 mg day<sup>-1</sup></p> <p><i>The only correct answer is <b>B</b></i></p> <p><b>A</b> is not correct because 43 is the increase required to achieve a 0.05 reduction in relative risk</p> <p><b>C</b> is not correct because 118 is the Mg<sup>2+</sup> intake that is associated with a 0.25 reduction in relative risk</p> <p><b>D</b> is not correct because 347 is the correct column chosen with no subtraction</p>	(1)