OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



MARK SCHEME

B2.5 HOW CAN LIFESTYLE, GENES AND THE ENVIRONMENT AFFECT HEALTH? (HIGHER)

SCORE	PERCENTAGE
/64	%

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Question			Answer/Indicative content	Marks	Guidance
1		i	As the percentage of fat in the diet increases, the greater the risk of dying from heart disease ✓	2 ~~1~~	**ALLOW** reduce cholesterol / salt
		ii	**Any two from** Reduce amount of fat in diet ✓ Reduce stress ✓ Stop smoking ✓ Take (regular) exercise ✓		
			Total	**3**	
2		i	Less than / before 30; (age) when stopped smoking;	2	**Do not accept** 30 (and under)
					Examiner's Comments
					Most candidates scored both marks for saying “less than 30” and “when they give up smoking”. However several candidates only gave one of the responses thus scoring only one of the marks. Only a few candidates stated that “<” meant more than.
		ii	11 – 5.6; 5.4;	2	5.4 alone = 2 marks
					Examiner's Comments
					Many candidates struggled with the percentage calculation. Credit was given for the correct answer without the calculations but candidates should be warned that this is a risky strategy. Some candidates were awarded one mark for correctly showing the calculation even though they completed the calculation incorrectly. Candidates would be well advised to show their calculations.

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Question			Answer/Indicative content	Marks	Guidance
		iii	*Any two from:* The **younger** you are when you **stop** the lower the risk / the **older** you are when you **stop** the higher the risk; Even if never smoked still have a risk / low(est) risk; **Rate** of increase of risk increases with age / doubles every ten years;	2	**Do NOT ACCEPT** the LONGER you smoke the higher the risk ORA **Do not accept** The longer / later (you leave it) to stop smoking the higher the risk **Accept** positive correlation between age and risk for 1 mark **Examiner's Comments** This was a good discriminator. Good answers included "the older you are when you stop, the higher the risk" or "even if you have never smoked there is a small risk". The most common error was to refer to the time that a person had been smoking. This was not credited as it was impossible from the data to determine the length of time that people had smoked. Indeed that was covered in the next question.
		iv	(As) **how long** they have smoked.....; .....increases, risk increases;	2	**Accept** idea that it is uncertain how long they have been smoking. Trend must be identified for 2nd mark e.g. longer you smoke the bigger the risk ORA = 2 marks; **Examiner's Comments** This required candidates to demonstrate that they realised that this would allow the determination of time that people had smoked. Very few went on to score the second mark by referring to the length of time spent smoking affected the risk of developing cancer.
			Total	8	

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Question			Answer/Indicative content	Marks	Guidance
3			**Food / intake idea** eg Poor diet explained eg fat clogs arteries; **Exercise idea** eg Lack of exercise explained eg unfit ORA;	2	**Accept** recreational / illegal drugs and alcohol for Food idea **Accept** any good explanation. e.g fat clogs arteries / salt raises blood pressure **Examiner's Comments** This was an example where some candidates did not read the question carefully. Simply identifying lifestyle choices did not gain marks unless the choice was explained. Thus “a sugary diet” did not score but “a diet rich in sugar could lead to type 2 diabetes” did score.
			Total	2	

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Question			Answer/Indicative content	Marks	Guidance
4	a	i	4.5 (cm);	1	Examiner's Comments This question discriminated well between candidates. Most candidates gave the correct answer of 4.5 cm. The most common incorrect response was 6.5 cm.
		ii	2 from:Any idea / example of differentcircumstance or risk age / weight / health / lifestyle / fitness /etc;Some engage / be AO is same size so ignore "more urgent" "They" refers to group 1	2	Examiner's Comments This question discriminated well between candidates. Examiners credited answers from three areas. For example, good responses included reference to the risks involved in the operation, the fact that patients in Group 1 were not operated upon, and finally that some patients simply decided not to have the operation.
	b		Idea of benefit outweighs risk;	1	Accept risk of aneurism outweighs risk of surgery Risk of not having the surgery is greater.
					Examiner's Comments This question discriminated well between candidates. This was well answered with the most common response being that the benefits outweighed the risks.

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Question			Answer/Indicative content	Marks	Guidance
	c		Calculated risk is 5.7% / based on data / stats / results / numbers; Perceived risk is what the patient thinks (the risks are) / opinion;	2	**Ignore** risk is calculated / probability / valueb **Ignore** doctors opinion **Examiner's Comments** This question discriminated well between candidates. Many candidates struggled with this. Good answers included responses such as perceived risk is what the patients think the risk is and calculated risk includes data/statistics/numbers. Candidates should avoid tautology such as saying perceived risk is what the patient perceives and calculated risk is what the patient calculates.
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
5			[Level 3] Includes some indicatives points from all three areas. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] Includes some indicative points from two areas. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) [Level 1] Includes some indicative points from one area. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	• BMI = 90 / 2.89 • = 31.(14) • Needs to be 24 or below • Refers to 29% fat Indicative scientific points concerning conclusions • Neil is obese • Neil is above average on fat scale • Idea that BMI is not completely reliable / accurate Indicative scientific points for action may include: • Yes (he should be concerned.) • Lose weight • (Do more) exercise • Data / scientific points This question is targeted at grades up to C Indicative scientific points referring to the tables may include: Use the L1, L2, L3 annotations in RM Assessor; do not use ticks. Examiner's Comments This question was a level of response question and overlapped with the foundation tier. This question was answered exceptionally well by almost all candidates. Credit was given for candidates calculating the BMI, referring to data in the table, then drawing appropriate conclusions and finally indicating what action “Neil” should take. Most answers were a pleasure to mark with the majority of candidates scoring full marks. The only criticism was that some candidates did the BMI calculation in the white space next to the table, but did not refer to the calculation when they wrote their answer. Examiners were instructed to look at the white space before awarding

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Question			Answer/Indicative content	Marks	Guidance
					the mark to ensure that candidates were given the mark that they deserved.
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
6	a	i	155 95;	1	Both required for the mark Units not required **Examiner's Comments** Most candidates correctly identified both the diastolic and systolic pressure readings from the graph. Both readings were required to score the mark.
		ii	<table><tr><th>low</th><th>ideal</th><th>pre-high</th><th>high</th></tr><tr><td></td><td></td><td></td><td>✓</td></tr></table>	1	**Examiner's Comments** This question was also well answered, with most candidates determining from the chart, that the blood pressure readings were in the high category.
	b		27 to 35;	1	**Examiner's Comments** Once again, candidates scored well on this question. As it was hard to be specific concerning the exact date that the medicine was administered a range of answers from day 27 to day 35 was accepted.
	c		Idea of doing different activities / exercise / stress / salt / alcohol / smoking;	1	OWTTE **Ignore** medicine / diet / sugar **Examiner's Comments** This was also answered well by most candidates. A wide range of responses were accepted, but vague answers that just referred to diet were not. Better answers referred to exercise, varying activities, smoking, or stress.
	d	i	120 (2); 840 / 7;	2	120 = 2 marks **Examiner's Comments** Most candidates scored two marks for this question. Some candidates however answered incorrectly and wasted the opportunity of scoring at least one of the marks, by not showing their calculations. Students should always be encouraged to show their calculations as this can often salvage at least some of the marks.

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Question			Answer/Indicative content	Marks	Guidance
		ii	Idea of best estimate of true / actual value; OR compare with other data / results / means;	1	**Allow** accurate **value** **Ignore** actual results **Ignore** reference to outliers **Ignore** true **results / accurate results** **Examiner's Comments** This proved to be a more challenging question. Vague answers that just referred to producing a more accurate result were not credited. Better answers referred to being closer to the true value or being able to compare with other sets of data. It is time well spent for centres to ensure that candidates are familiar with all the statements that deal with definitions in the specification.
		iii	115; 125;	1	Accept either way round Units not required **Examiner's Comments** Candidates performed well on this question, correctly identifying the extremes of the range from the data in the table.
		iv	*Idea that blood pressure (systolic) is lower* after answer to part b / between day 1 / 155 to day 60 / 115 / between start and end / between first 7 days / 142.7 and last 7 days / 120; Ref to diastolic pressure also dropped at same time;	2	ecf for day medicine taken **Examiner's Comments** This question was not answered well. Many candidates failed to make it clear that their answer referred to data both before and after the medicine was taken. This lack of comparison resulted in some candidates failing to score. Another error was that most candidates only used data from the systolic readings on the graph and failed to refer to the diastolic data. Examiners used 'error carried forward' to determine the date the medicine was taken in order to compare before and after data.
			Total	**10**	

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Question			Answer/Indicative content	Marks	Guidance
7		i	6900	1	if no answer written below question, check table Examiner's Comments 6900 was the correct response.
		ii	both correct calculations of pulse rate (1) correct conclusion from their data (1)	2	Byron's is 5440 / 80 = 68 / Colin is 4970 / 70 = 71 Allow ecf for second marking point Examiner's Comments Most candidates were able to process the data accurately and identify the correct person.
		iii	the pulse rate (measurements) varies / there is insufficient variation in the measurements (1) any one from: repeat the measurements (1) take the mean (1) measure time taken to return to resting pulse rate (1) measures the pulse rate over a long time period (1)	2	ignore discussion of outliers Examiner's Comments The best responses recognised that pulse rates can vary in addition to stating a way of increasing the confidence in the results.
			Total	5	
8			Huntington's disorder obesity ✓ bacteria causing sore throat heart disease ✓ skin cancer ✓ virus causing common cold cystic fibrosis colour blindness inherited from father	1	4 ticks or more ticks = 0 marks Examiner's Comments This question was well answered with the majority of candidates correctly identifying all three points to score the single mark available. Candidates who gave additional incorrect responses were not awarded the mark.
			Total	1	

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Question			Answer/Indicative content	Marks	Guidance
9	a		$86/1.70^2$ OR $86/1.7^2$ (1) 29.8 (1)	2	Any answer between and including 29 ? 30 = 1 mark **do not accept** units / cm^2 29.8 alone scores 2 marks **Examiner's Comments** This question proved to be a straightforward start to the examination with most candidates scoring both marks. For candidates who did not write down the correct answer, credit was available for one mark for correct substitution of the numbers into the formula.
	b		overweight	1	ecf **Examiner's Comments** The vast majority of candidates correctly realised that the category for BMI had changed to overweight and thus scored the mark. Examiners were instructed to use an error carried forward from part (a) to ensure that candidates were not penalised for the same mistake twice.
	c		**accuracy**how close to true value / correct value (1) **repeatability** the readings are nearly the same / close to previous reading / similar (1)	2	**ignore** how accurate the readings were **ignore** / right value / valid / precise **ignore** equipment gives correct results **Examiner's Comments** This question discriminated well. Just over one third of candidates failed to score. However those who had learnt the definition knew that accuracy was how close to the true value the measurement was and that repeatability meant getting the same results when the experiment was repeated. Weaker candidates simply thought that the experiment had to be repeated.

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Question			Answer/Indicative content	Marks	Guidance
	d	i	Any two from: BMI change of 26 ? 25/1 / which is small / which is borderline; so change in risk would be smaller (than 22%) / idea that not everyone in range would have same risk / those higher in range would have a higher risk ORA; Idea that risk data is averaged / mean	2	ignore ref to risk factors ignore estimate Examiner's Comments This proved to be a difficult question with over a third of candidates failing to score. Most scored one of the two marks available. Good answers included reference to the fact that the BMI change was very small so the change in risk would be small, or that the risk was averaged from the group and not everyone within the group would have the same risk. Weaker candidates wrote about BMI and the different factors that affected the risk of having heart disease.
		ii	the risk / probability is low (1) but the consequences are high / could die (1)	2	ignore lower / decreased Examiner's Comments This question proved to be more difficult than expected. Although most candidates scored the first mark for stating that the risk was low, very few went on to state that the consequence was very high e.g. “they could die”. This was often due to the fact that most candidates did not understand the meaning of the word “consequence which is a specification word”.
			Total	9	

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Question			Answer/Indicative content	Marks	Guidance
10			**Level 3 (5–6 marks)** Explain blood pressure is the pressure of the blood on the walls of the arteries. Explains **how** at least one factor affects blood pressure Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Explains why there are two blood pressure numbers. Describes factors as increasing or decreasing blood pressure. Quality of written communication partially impedes communication of the science at this level. **Level 1 (1–2 marks)** Gives examples of factors which cause blood pressure to vary between individuals. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to A/ A*** **Indicative scientific points at Level 3 may include:** • arteries have muscular walls to maintain pressure when heart is relaxing • how cholesterol deposits increase blood pressure • how exercise can reduce blood pressure • how aging / hardening arteries increase blood pressure • how nicotine increase blood pressure **Indicative scientific points at Level 2 may include:** • describes blood pressure measurement as two numbers • higher number is when heart is contracting • lower number is when heart is relaxing • 120/80 = normal • Eg increased fitness decreases blood pressure **Indicative scientific points at Level 1 may** **include:** • weight / fitness / age / stress / inheritance / drugs / smoking / salt / fat • genetic Ignore references to poor / healthy diet. **Use the L1, L2, L3 annotations in Scoris; do not use ticks.** **Examiner's Comments** This was the second of the six-mark extended-writing questions. Blood pressure was not on the previous specification and many candidates did not seem to have a

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Question			Answer/Indicative content	Marks	Guidance
					good understanding of the topic. However, the majority of candidates knew factors that affected blood pressure, although many digressed into a discussion of heart disease. Stronger candidates could say whether the factors they listed increased or decreased blood pressure and in some cases, particularly for fatty foods, could explain the mechanism. A significant number of candidates were not aware that blood pressure is composed of two readings and those that did mention it commonly thought one of the readings was heart rate, possibly because many electric sphygmomanometers also read heart rate.
			Total	6	
11	a		<table><tr><td>With a very low income, women are certain to get heart disease.</td><td></td></tr><tr><td>In women, each time income is halved, the risk of heart disease is doubled.</td><td></td></tr><tr><td>Men are more at risk of heart disease than women.</td><td>✓</td></tr><tr><td>With a high income, women are more at risk of heart disease than men.</td><td></td></tr><tr><td>There are other risk factors for heart disease apart from income.</td><td></td></tr><tr><td>No one at high income gets heart disease.</td><td></td></tr><tr><td>For men, the lower the income the greater the risk of heart disease.</td><td>✓</td></tr><tr><td>From middle to high income, the risk for women remains unchanged.</td><td>✓</td></tr></table>	3	if more than three boxes are ticked deduct one mark for each additional tick **Examiner's Comments** All of this question (Question 3) was common with the foundation tier. This question was well answered candidates were clearly well trained in interpreting graphs.
	b		C; 4;	2	**accept** any unambiguous indication using lines on table **Examiner's Comments** This part was well answered. Where only one mark was scored this was often because candidates thought the graph proved a causal link rather than just being a correlation.
	c		<table><tr><td>All the men should be the same height.</td><td></td></tr><tr><td>Both men and women should be chosen at random</td><td>✓</td></tr><tr><td>The sample size should be as large as possible</td><td>✓</td></tr><tr><td>The woman should all have a high income.</td><td></td></tr><tr><td>Only people with a history of heart disease should be included.</td><td></td></tr><tr><td>The two groups should be checked that they match on as many factors as possible.</td><td>✓</td></tr><tr><td>The study should be a double blind trial.</td><td></td></tr></table>	3	if more than three boxes are ticked deduct one mark for each additional tick **Examiner's Comments** This part was also well answered with candidates showing a good understanding epidemiological study design.
			Total	8	

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