

GENERAL CERTIFICATE OF SECONDARY EDUCATION

ADDITIONAL APPLIED SCIENCE

A191/02

Unit A191: Science in Society (Higher Tier)

Candidates answer on the question paper
 A calculator may be used for this paper

OCR Supplied Materials:
 None

Duration: 1 hour

Other Materials Required:

- Pencil
- Ruler (cm/mm)

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks for each question is given in brackets [] at the end of the question or part question.
- The total number of marks for this paper is **50**.
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Imran's ambition is to be an international cricket star.

His coach carries out a baseline assessment including calculating Imran's Body Mass Index (BMI).

(a) Imran is 2.0m tall and has a mass of 76kg.

(i) Calculate Imran's body mass index (BMI).

Show your working.

Imran's BMI = [3]

(ii) Should the coach be concerned about Imran's BMI?

Explain your answer.

.....

.....

..... [3]

- (b) The coach checks the speed that Imran can bowl a cricket ball.
The ball travels 21m in 0.5 seconds.

Write down the formula that the coach uses to work out the speed of the cricket ball.

Calculate the speed of the ball.

speed of cricket ball = m/s [2]

- (c) The table contains data about average bowling speeds of different types of bowlers.

type of bowler	average speed (m/s)
fast	38 and above
medium - fast	33 to 38
medium	31 to 33
spin	20 to 25

Using the table, suggest what sort of bowler Imran should train to be.

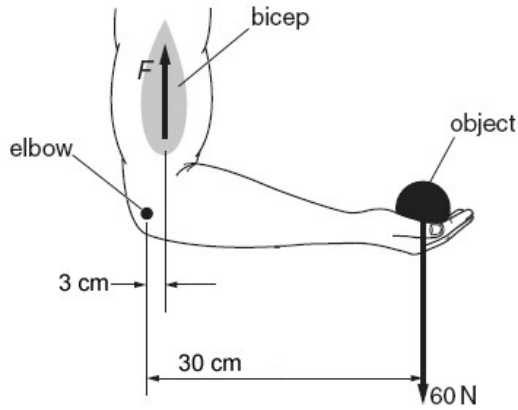
Why is this deduction not completely reliable?

.....

.....

..... [2]

- (d) Imran needs to build up the muscles in his arm to improve his bowling. He does this by lifting a heavy object. The diagram shows the forces on Imran's arm.



- (i) Explain why **muscle F** has to exert a force greater than 60N when lifting Imran's arm.

.....

 [3]

- (ii) Weight training forms part of Imran's fitness programme.

Describe what other training the coach would include in a fitness programme to improve Imran's bowling.

.....

 [2]

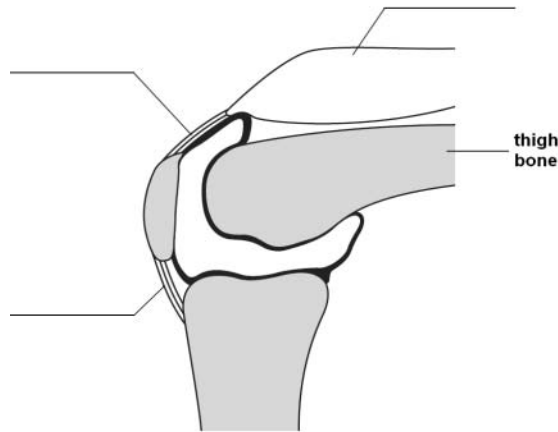
[Total: 15]

2 Sanjay is a mountain biker.



Sanjay's coach needs to understand how the muscles, tendons and ligaments in Sanjay's knees are used when mountain biking.

(a) Complete the labelling of the diagram of Sanjay's knee.



[2]

(b) Explain how these structures in Sanjay's knee are used as he rides his mountain bike.

.....

.....

..... [3]

3 Mike goes into hospital for a major operation.

The nurse asks Mike some questions about his lifestyle and medical history.

(a) Write down **two** questions that the nurse might ask Mike about his lifestyle and explain why this information is needed.

.....

.....

.....

.....

.....

.....

..... [2]

(b) Write down **two** questions that the nurse might ask Mike about his medical history and explain why this information is needed.

.....

.....

.....

.....

.....

.....

..... [2]

- (c) As Mike answers the nurse's question he tells her he is allergic to penicillin. She records very detailed notes in his medical file. Suggest and explain reasons why she does this.

.....

.....

..... [3]

[Total: 7]

(b) Her midwife also explains what post-natal care Wendy's baby will get.

Which of the following will form part of the baby's **post-natal** care?

Put ticks (✓) in the boxes next to the correct answers.

fetal ultrasound scans	
blood pressure check for pre-eclampsia	
APGAR score	
developmental tests	
IVF treatment	
using growth charts to monitor baby's growth	
checking for gestational diabetes	

[2]

[Total: 8]

The table shows the results of tests, 1, 2, 3, 4, and 5, on different drinks containing the food dye.

sample	absorbance	concentration mg/dm ³
1	0.52	0.64
2	0.62	
3	0.38	0.48
4	0.18	
5	0.46	0.58

- (i) Using the graph, complete the table to find the concentrations of the food dye in the drinks tested.

[1]

- (ii) The EU maximum level for the dye is 0.6 mg/dm³.

Use the results from the table explain which drinks are not suitable for sale in the EU.

Explain your answer.

.....

.....

..... [2]

[Total: 9]

[Paper total: 50]

END OF QUESTION PAPER



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ADDITIONAL APPLIED SCIENCE

Unit A191: Science in Society (Higher Tier)

A191/02

MARK SCHEME

Duration: 1 hour

MAXIMUM MARK 50

Guidance for Examiners

Additional guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
not/reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant - applies to neutral answers
allow/accept	=	answers that can be accepted
(words)	=	words which are not essential to gain credit
<u>words</u>	=	underlined words must be present in answer to score a mark
ecf	=	error carried forward
AW/owtte	=	alternative wording
ORA	=	or reverse argument

Eg mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)
 work done = 0 marks
 work done lifting = 1 mark
 change in potential energy = 0 marks
 gravitational potential energy = 1 mark
5. Annotations:
 The following annotations are available on SCORIS.

✓	=	correct response
✗	=	incorrect response
bod	=	benefit of the doubt
nbod	=	benefit of the doubt not given
ECF	=	error carried forward
^	=	information omitted
I	=	ignore
R	=	reject
6. If a candidate alters his/her response, examiners should accept the alteration.

7. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

Eg

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth one mark.

Put ticks (✓) in the two correct boxes.

<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth one mark.

8. The list principle:
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, eg one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.
9. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.


Eg If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	


the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR


Question			Expected answers	Marks	Additional guidance
1	(a)	(i)	2 squared = 4 76/4 19	[3]	
		(ii)	weight in healthy range of BMI because healthy range is 18.5 to 25 his coach should not be worried about his weight but should bear in mind that it is close to the underweight region and that this is important when he plans his training/diet	[3]	
	(b)		speed = distance / time 42 m per second	[2]	
	(c)		fast bowler because his bowling speed indicates this from the table but this is using only one result therefore this deduction is not completely reliable as you would need to repeat measurement of bowling speed to give an average speed to make it more reliable	[2]	OWTTE
	(d)	(i)	the fulcum of the arm is at the elbow meaning that the 60N weight is further from the fulcum than muscle F therefore muscle F has to provide more than 60N to provide a turning moment because it is nearer the fulcum	[3]	
		(ii)	exercises to increase suppleness and fitness practice to improve technique / accuracy	[2]	
Total				[15]	

Question		Expected answers	Marks	Additional guidance
2	(a)	clockwise from top right muscle tendon ligament	[2]	3 correct = 2 marks 2 or 1 correct = 1 mark
	(b)	tendons attach the muscles to the bone muscles by contracting and relaxing move the knee to turn the peddles ligaments attach bone to bone so the joint does not dislocate as it moves to turn the peddles on the bike	[3]	
	(c) 	<p>[Level 3] Candidates get facts and processes correct leading to the correct changes in body temperature. All information in answer is relevant, clear, organised and presented in a structured and coherent format suitable for purpose. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p>[Level 2] Includes most of the above. May include some errors or omissions i.e. good account of one method of temperature control or partial account of both. For the most part the information is relevant and presented in a structured and coherent format suitable for purpose. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p>[Level 1] Refers to blood flow and sweating but no explanation given. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	[6]	<p>Relevant points:</p> <ul style="list-style-type: none"> • rise in temperature will stimulate receptors in Sanya's body • this causes the capillaries near his skin to dilate • so increasing the blood flow through them • it will also cause an increase in sweating • but this is not effective as the forest is humid so the sweat will not evaporate • therefore heat loss will be due to radiation from the skin • loss of water by conduction • because sweat will drip off him • loss of water by convection • because the speed of the bike will create draught so this will keep him cool
Total			[11]	

Question		Expected answers	Marks	Additional guidance
3	(a)	<p>any 2 ideas from how much exercise do you take? do you drink? do you smoke?</p> <p>to see if lifestyle factors are adversely affecting the patient's health or how they could be modified to improve his health</p>	[2]	
	(b)	<p>any 2 ideas from ... what previous treatments have you had? is there any family history of this condition? what medication are you on? what are your symptoms?</p> <p>to see if previous illnesses and/or treatments are affecting the current condition</p>	[2]	
	(c)	<p>the nurse does this so:</p> <p>there is a permanent record of his allergy to penicillin</p> <p>so other practitioners who may treat him are aware</p> <p>meaning that they will know not to prescribe him penicillin</p>	[3]	
		Total	[7]	

Question	Expected answers	Marks	Additional guidance
4 (a) 	<p>[Level 3] Both Wendy and midwife provide and ask for information. Understanding of informed consent and understanding risks. All information in answer is relevant, clear, organised and presented in a structured and coherent format suitable for purpose. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5 – 6 marks)</p> <p>[Level 2] Both Wendy and midwife provide and ask for information but only some of the points covered. For the most part the information is relevant and presented in a structured and coherent format suitable for purpose. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks)</p> <p>[Level 1] Answers or questions from either Wendy or midwife but not both sides given. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	[6]	<p>Relevant points:</p> <p>Wendy provides information and the midwife both provides and asks for information that may include....</p> <ul style="list-style-type: none"> • explaining risks of pregnancy to make sure Wendy is fully informed of all possible risks • getting and giving medical history so the midwife is aware of any underlying problems that could get worse during pregnancy • questions about lifestyle so the midwife can give advice on how to keep mother and baby healthy during pregnancy • recording details so that all medical practitioners will have the information they need to treat Wendy during her pregnancy • who has access to the information • explaining what is going to happen during her pregnancy, health checks etc <p>Informed consent asked for / given for pregnancy tests to find out about the health of the baby.</p>




Question		Expected answers		Marks	Additional guidance
(b)		fetal ultrasound scans		[2]	3 correct = 2 marks 2 correct = 1 mark
		blood pressure check for pre-eclampsia			
		APGAR score	✓		
		developmental tests	✓		
		IVF treatment			
		using growth charts to monitor baby's growth	✓		
		checking for gestational diabetes			
Total				[8]	

Question	Expected answers	Marks	Additional guidance
5 (a) 	<p>[Level 3] All information in answer is relevant, clear, organised and presented in a structured and coherent format suitable for purpose. Specialist terms are used appropriately. Few, if any, errors in sequencing, grammar, punctuation and spelling. (5 – 6 marks)</p> <p>[Level 2] For the most part the information is relevant and presented in a structured and coherent format suitable for purpose. Specialist terms are used for the most part appropriately. There are occasional errors in sequencing, grammar, punctuation and spelling. (3 – 4 marks)</p> <p>[Level 1] Some relevant information in a limited form There may be limited use of specialist terms. Errors of sequencing, grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	[6]	<p>Relevant points:</p> <p>Chromatography</p> <ul style="list-style-type: none"> • is a qualitative technique that shows which colours are present in the dye • it separates the colours by using their differing attraction to the solvent (mobile phase) to the paper (stationary phase) • the R_f value of the colours can then be calculated and matched to standard • R_f values hence identifying the colours in the dye <p>Whereas using a colorimeter</p> <ul style="list-style-type: none"> • is a quantitative technique that shows how much of a particular dye is present • it uses the measurement of intensity of colour to assess the dyes concentration • it needs to be calibrated using standard solutions of the food dye then plotting a calibration curve • which then can be used to identify the amount of dye in an unknown sample

Question		Expected answers			Marks	Additional guidance	
	(b)	(i)	sample	absorbance	concentration mg/dm ³	[1]	
			1	0.52	0.66		
			2	0.62	0.8		
			3	0.38	0.48		
			4	0.18	0.24		
			5	0.46	0.58		
		(ii)	<p>from the results in the table, sample one and two have higher concentrations of the dye than is allowed by the EU. Their concentrations are above 0.6 mg/dm³</p> <p>this means these drinks could not be sold in the EU because they would be breaking regulations and may pose a risk to health</p>			[2]	
Total					[9]		
Paper total					[50]		

Assessment Objectives (AO) Grid

(includes quality of written communication )

Question	AO1	AO2	AO3	Total
1(a)(i)		3		3
1(a)(ii)	1	2		3
1(b)	1	1		2
1(c)		1	1	2
1(d)(i)		3		3
1(d)(ii)		2		2
2(a)	2			2
2(b)	2	1		3
2(c) 	3	3		6
3(a)	2			2
3(b)	2			2
3(c)	1	2		3
4(a) 	3	3		6
4(b)	2			2
5(a) 	3	3		6
5(b)(i)		1		1
5(b)(ii)			2	2
Totals	22	25	3	50

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