

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**

**ADDITIONAL APPLIED SCIENCE**

**A191/01**

Unit A191: Science in Society (Foundation 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**

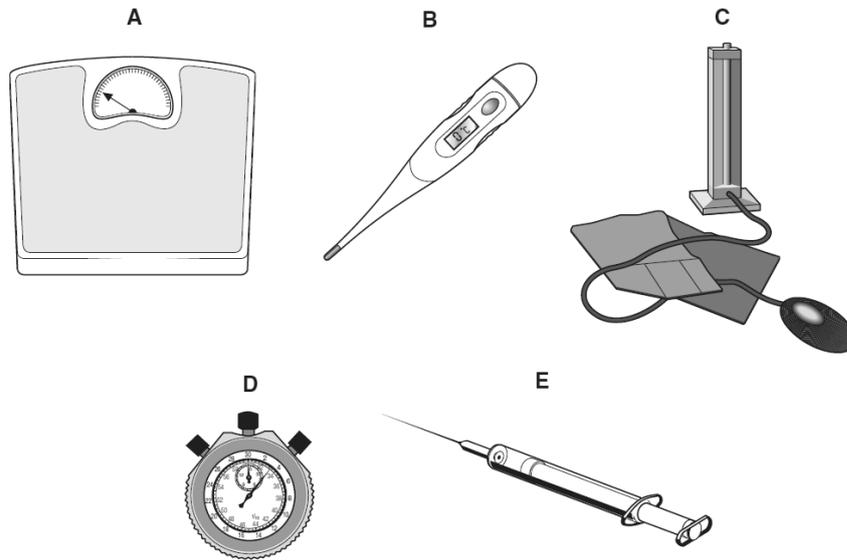
- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks for each question is given in brackets [ ] at the end of the question or part question.
- The total number of marks for this paper is **50**.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Ricardo is a nurse. He assesses fitness.

He carries out tests on a new patient called Sally.

Some of the equipment he uses is shown in the diagram.



(a) Look at the diagram of the equipment.

Write down the letter, **A, B, C, D or E**, of the equipment which he would use for each test.

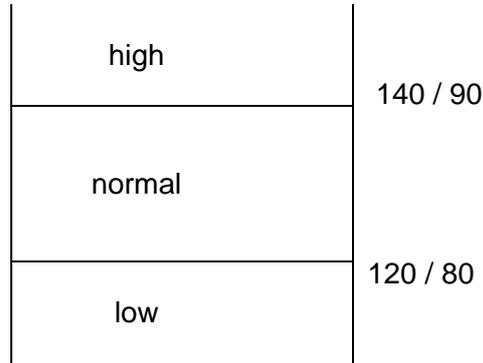
The first one has been done for you.

measure Sally's mass	<input type="text" value="A"/>
measure her pulse rate	<input type="text"/>
measure her blood pressure	<input type="text"/>
measure her temperature	<input type="text"/>

[2]

(b) Sally's blood pressure is 130/85

Look at the information about blood pressure.



What conclusion can you draw about Sally's blood pressure?

Explain the effect this may have on her life.

.....

.....

..... [2]

(c) Sally is an athlete.

Ricardo asks Sally questions about her lifestyle, health and fitness.

Put a ring in the **subject** column to show whether each reply refers to lifestyle, health or fitness.

replies	subject
I run five miles three times a week.	lifestyle    health    fitness
I sprained my ankle two years ago and had a cold last week.	lifestyle    health    fitness
I smoke five cigarettes a day and enjoy a drink at the weekend.	lifestyle    health    fitness

[2]

**(d)** Local sport and fitness facilities are provided for the community.

Explain how people who work there can help to keep you in good health.

*✎ The quality of written communication will be assessed in your answer to this question.*

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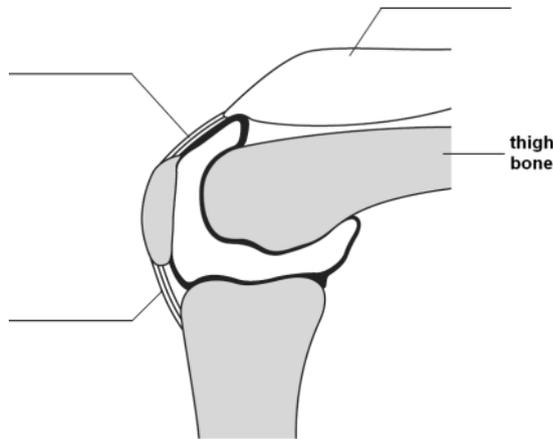
[6]  
[Total: 12]

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]

[Total: 5]

3 Marcus returns from a holiday abroad.

He collapses and becomes unconscious as he waits for his luggage at the airport.



At the hospital Marcus is treated immediately by medical staff.

Other people at the hospital have been waiting for a long time.

Explain how the nurses in the accident and emergency department assess Marcus and know why he should be treated before other patients.

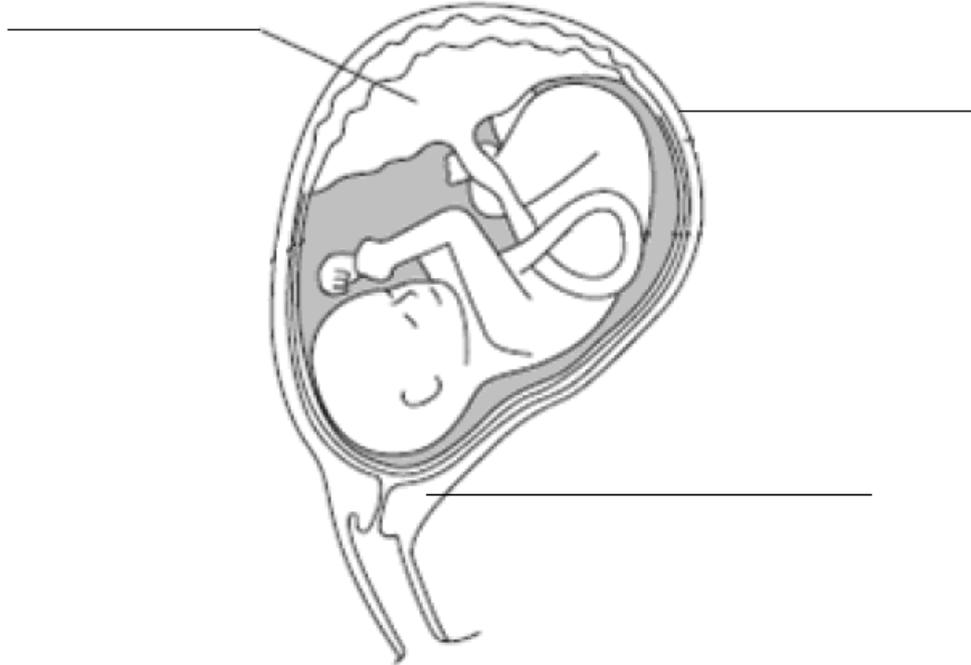
.....

.....

..... [3]

[Total: 3]

- 4 Wendy is pregnant.  
She visits the hospital to see her midwife.  
The diagram shows Wendy's unborn baby.



- (a) Complete the labelling of the diagram.  
Choose from these labels.

amniotic fluid

uterus

placenta

cervix

umbilical cord

[2]



5 Rhiannon collects scientific evidence from a crime scene before it is analysed.

(a) Which **two** of the following are **not** examples of the stages involved in the collection, storage and preparation of samples for analysis?

Put ticks (✓) in the boxes next to these **two** statements.

Rhiannon collects several samples of blood from the crime scene.	
Rhiannon is paid above the national average salary.	
Rhiannon puts the samples in plastic bags.	
Rhiannon stores the samples in the fridge.	
Rhiannon locks the fridge.	
Rhiannon disposes of the samples safely.	

[2]

(b) She sends the samples to a public laboratory to be analysed. Public laboratories have a system of accreditation.

Give **two** reasons why.

reason 1.....

.....

reason 2.....

..... [2]

[Total: 4]



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 <sup>3</sup>
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/dm<sup>3</sup>.

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

Explain why.

.....

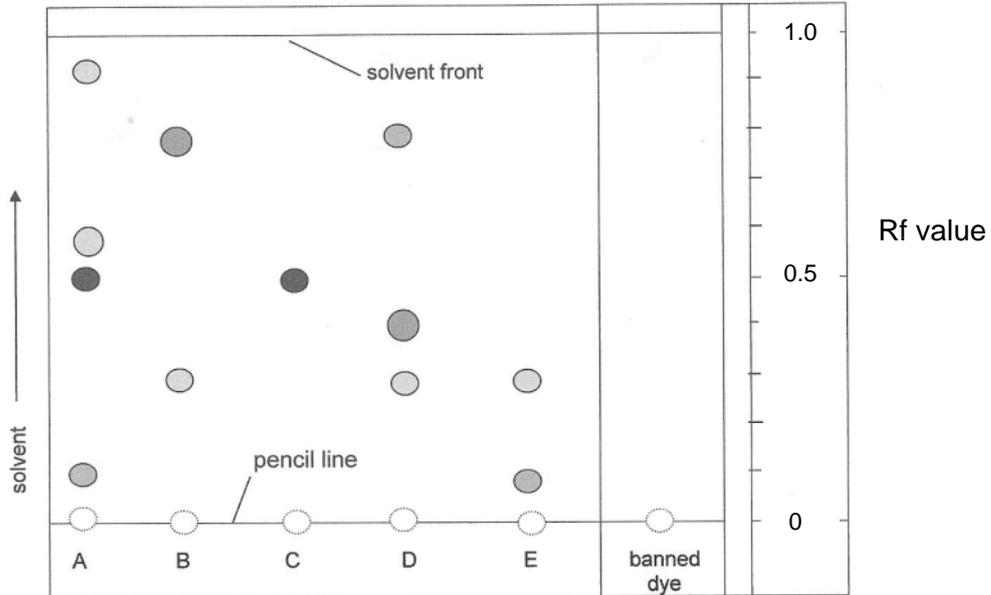
.....

..... [2]

[Total: 9]

7 A Trading Standards scientist tests children's toys to make sure that they are not coloured with a dye that has been banned from use.

She tests the dyes from five different coloured toys, **A**, **B**, **C**, **D** and **E**, using thin layer chromatography.



- (a) She also tests a banned dye.  
 The solvent front moves 5 cm.  
 The banned dye moves 3 cm.  
 Calculate the Rf of the banned dye.

Rf = ..... [2]

- (b) Draw the banned dye on the diagram of the chromatogram shown above.

[1]

(c) Which toys, **A**, **B**, **C**, **D** or **E**, should not be sold to the public?

Explain your answer.

.....

.....

..... [2]

(d) The scientist tests the samples again using a different solvent.

Put ticks (✓) against the **two** statements that, when taken together, explain why.

all dyes dissolve in lots of different solvents	
different solvents separate different dyes	
more data can be collected about which dyes are present	
there is only one colour present in the dye	
the scientist wanted to make it a fair test	

[2]

[Total: 7]

[Paper Total: 50]

**END OF QUESTION PAPER**

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**GENERAL CERTIFICATE OF SECONDARY EDUCATION**

**ADDITIONAL APPLIED SCIENCE**

**A191/01**

Unit A191: Science in Society (Foundation Tier)

**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
  - words = 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 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)	D C B	[2]	3 correct = 2 marks 1 or 2 correct = 1 mark
	(b)	Sally's blood pressure lies within the normal range being 130/85. This means that she is unlikely to experience health problems due to blood pressure	[2]	
	(c)	fitness health lifestyle	[2]	3 correct = 2 marks 1 or 2 correct = 1 mark

Question	Expected answers	Marks	Additional guidance
1 (d) 	<p><b>[Level 3]</b> Activity plus role of employee plus qualification extended e.g. gym – trainer – improves fitness – uses baseline data / helps me slim / reduces my blood pressure etc. 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><b>[Level 2]</b> Activity plus role of employee plus qualification, e.g. tennis – coaching lessons – to improve game or stop injury from happening. 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><b>[Level 1]</b> Example of exercise and what employee does, e.g. swimming – life guard stop person from drowning. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1 – 2 marks)</p> <p><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	[6]	<p><b>Relevant points:</b></p> <p><b>Level 3 answer</b> Gyms have trainers that help to improve your fitness and therefore maintain your good health. They also collect baseline data such as information on agility, speed, endurance, co-ordination, power, flexibility and strength, so you can see how well you are improving and may give advice on health and lifestyle issues such as BMI, blood pressure, smoking and drinking.</p> <p><b>Level 2 answer</b> You can get coaching lessons to play tennis that will help improve your game and stop you from having an injury.</p> <p><b>Level 1 answer</b> Swimming pools have life guards to stop you drowning.</p>
	<b>Total</b>	<b>[12]</b>	

Question		Expected answers	Marks	Additional guidance
2	(a)	muscle tendon ligament	[2]	3 correct = 2 marks 2 or 1 correct = 1 mark
	(b)	tendons attach the muscle to the bone  muscle by contracting and relaxing moves the knee to turn the peddles  the ligaments attach bone to bone so the joint does not dislocate as it moves to turn the peddles on the bike	[3]	
<b>Total</b>			[5]	

Question	Expected answers	Marks	Additional guidance
3	<p>a triage nurse will assess Marcus' condition by looking at his vital signs, temperature, pulse rate, respiration rate, blood pressure and whether he is conscious</p> <p>if any of these are causing concern such as a high/low temperature, high/low blood pressure, shallow/fast respiration or no respiration, fast/weak pulse, or unconscious</p> <p>meaning Marcus will be treated before other patients who are in a more stable condition because his condition may be life-threatening</p>	[3]	accept needs stabilisation/treatment as third marking point
	<b>Total</b>	[3]	

Question	Expected answers	Marks	Additional guidance
4 (a)	clockwise from top list placenta uterus cervix	[2]	3 correct = 2 marks 1 or 2 correct = 1 mark
(b)		[2]	

Question	Expected answers	Marks	Additional guidance
<p>(c)</p> 	<p><b>[Level 3]</b>  All stages in sensible order.  Risk free, how and why.  Suggestions of what the blood will be tested for.  Correct technical terms.  Selects vein as opposed to blood vessel or artery.  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, spelling and punctuation.  (5 – 6 marks)</p> <p><b>[Level 2]</b>  Less technical terms, i.e. more description.  Incomplete with only some explanation.  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, spelling and punctuation.  (3 – 4 marks)</p> <p><b>[Level 1]</b>  Brief vague account, i.e. not enough information to carry out the procedure.  There may be limited use of specialist terms. Errors in sequencing, grammar, spelling and punctuation prevent communication of the science.  (1 – 2 marks)</p> <p><b>[Level 0]</b>  Insufficient or irrelevant science. Answer not worthy of credit.  (0 marks)</p>	<p>[6]</p>	<p><b>Description of procedure:</b></p> <ul style="list-style-type: none"> <li>• the nurse will start by applying a pressure collar to Wendy's upper arm to make the veins stick out</li> <li>• she will then select a vein on the inside of the elbow and rub the area of the vein with an antiseptic wipe</li> <li>• then the nurse will insert a sterile needle attached to a sterile syringe carefully into the vein and withdraw the plunger in the syringe so the syringe fills with blood</li> <li>• she will next remove the needle from the vein and place a sterile dressing over the wound</li> </ul> <p><b>Safety and well-being of patient:</b></p> <ul style="list-style-type: none"> <li>• antiseptic wipes to clean the skin, sterile needle, syringe and dressing are used to prevent infection being introduced into Wendy's body</li> <li>• the blood is transferred to a labelled sample tube so that the blood sample does not get mixed with other peoples blood samples, therefore ensuring Wendy gets the right results from her blood</li> </ul> <p><b>Results of the blood test:</b></p> <ul style="list-style-type: none"> <li>• levels of alpha – fetoprotein (AFP), unconjugated oestriol, gonadotrophin and glucose are measured</li> <li>• these show together with other factors</li> <li>• whether Wendy has the risk of diabetes</li> <li>• and her baby has the risk of having Down's syndrome or spina bifida</li> </ul>
		<p>[10]</p>	

Question		Expected answers	Marks	Additional guidance	
5	(a)	Rhiannon collects several samples of blood from the crime scene.	[2]		
		Rhiannon is paid above the national average salary.			✓
		Rhiannon puts the samples in plastic bags.			
		Rhiannon stores the samples in the fridge.			
		Rhiannon locks the fridge.			
		Rhiannon disposes of the samples safely			✓
5	(b)	Any 2 from: checking accuracy checking precision giving clients confidence	[2]		
<b>Total</b>			<b>[4]</b>		

Question	Expected answers	Marks	Additional guidance
6 (a) 	<p><b>[Level 3]</b> 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><b>[Level 2]</b> 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><b>[Level 1]</b> 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><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	[6]	<p><b>Relevant points:</b></p> <p><b>Chromatography</b></p> <ul style="list-style-type: none"> <li>• is a qualitative technique that shows which colours are present in the dye</li> <li>• it separates the colours by using their differing attraction to the solvent (mobile phase) to the paper (stationary phase)</li> <li>• the Rf value of the colours can then be calculated and matched to standard</li> <li>• Rf values hence identifying the colours in the dye</li> </ul> <p><b>Whereas using a colorimeter</b></p> <ul style="list-style-type: none"> <li>• is a quantitative technique that shows how much of a particular dye is present</li> <li>• it uses the measurement of intensity of colour to assess the dyes concentration</li> <li>• it needs to be calibrated using standard solutions of the food dye then plotting a calibration curve</li> <li>• which then can be used to identify the amount of dye in an unknown sample</li> </ul>

Question			Expected answers			Marks	Additional guidance
6	(b)	(i)	sample	absorbance	concentration mg/dm <sup>3</sup>	[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		
	(b)	(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/dm<sup>3</sup></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]	accept reverse argument
<b>Total</b>						[9]	

Question		Expected answers	Marks	Additional guidance										
7	(a)	3/5 0.6	[2]											
	(b)	spot above banned dye and spot at 0.6	[1]											
	(c)	toy A could not be sold to the public  because from the chromatogram one of the dyes in the paint on toy A has the same Rf value as the banned dye, therefore toy A contains the banned dye	[2]											
	(d)	<table border="1"> <tbody> <tr> <td>all dyes dissolve in lots of different solvents</td> <td></td> </tr> <tr> <td>different solvents separate different dyes</td> <td>✓</td> </tr> <tr> <td>more data can be collected about which dyes are present</td> <td>✓</td> </tr> <tr> <td>there is only one colour present in the dye</td> <td></td> </tr> <tr> <td>the scientist wanted to make it a fair test</td> <td></td> </tr> </tbody> </table>	all dyes dissolve in lots of different solvents		different solvents separate different dyes	✓	more data can be collected about which dyes are present	✓	there is only one colour present in the dye		the scientist wanted to make it a fair test		[2]	
all dyes dissolve in lots of different solvents														
different solvents separate different dyes	✓													
more data can be collected about which dyes are present	✓													
there is only one colour present in the dye														
the scientist wanted to make it a fair test														
<b>Total</b>			[7]											
<b>Paper Total</b>			[50]											

## Assessment Objectives (AO) Grid

(includes quality of written communication )

Question	AO1	AO2	AO3	Total
1(a)	2			2
1(b)		2		2
1(c)		2		3
1(d) 	3	3		6
2(a)	2			2
2(b)	2	1		3
3	1	2		3
4(a)	2			2
4(b)	2			2
4(c) 	3	3		6
5(a)	2			2
5(b)	2			2
6(a) 	3	3		6
6(b)(i)		1		1
6(b)(ii)			2	2
7(a)		2		2
7(b)		1		1
7(c)		1	1	2
7(d)		2		2
<b>Totals</b>	<b>24</b>	<b>23</b>	<b>3</b>	<b>50</b>

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