OCR
Oxford Cambridge and RSA

H

Friday 16 June 2017 – Morning

GCSE ADDITIONAL APPLIED SCIENCE

A191/02 Science in Society (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)
- Calculator

Duration: 1 hour

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Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks is given in brackets **[ ]** at the end of each 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 Joe is an athlete.
He ran in the London Olympics.

(a) When Joe sprints, he releases energy for his muscles by a process called respiration.

Which of the following substances may be **produced** by respiration?

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

oxygen	☐
carbon dioxide	☐
urea	☐
lactic acid	☐
glucose	☐

[2]

(b) Joe can sprint 100 m in 10 seconds.

(i) Rearrange this formula to show how you would calculate Joe's speed.

distance = speed × time

speed =

[1]

(ii) What is Joe's average speed over 100 m?
Show your working.

average speed = ... **[2]**

(iii) Suggest why it is important that Joe's coach monitors his speed over 100 m on a regular basis.

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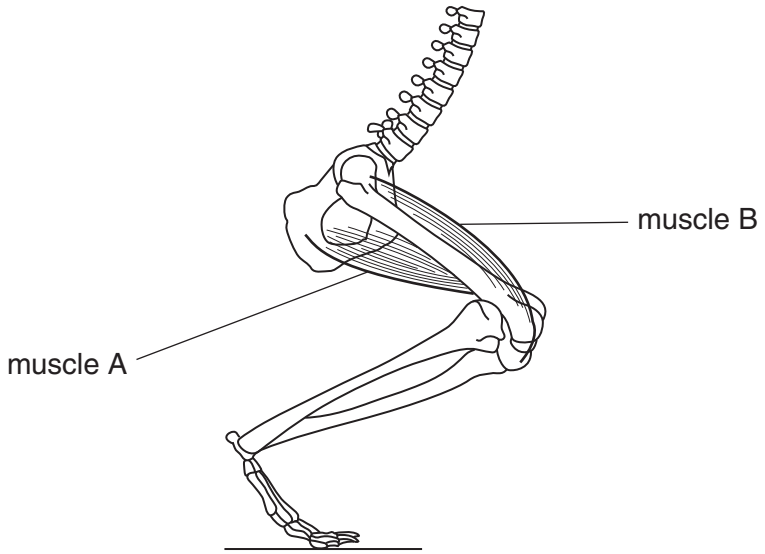
..... **[1]**

(c) During the Olympics, Joe's urine was tested for any performance enhancing drugs.

Write down an example of a performance enhancing drug that a cheating athlete may have used.

..... **[1]**

(d) The diagram shows part of Joe's skeleton when he is on the starting blocks for a race.



(i) When the race starts, muscles A and B contract as Joe runs.

What does each muscle do to the leg?

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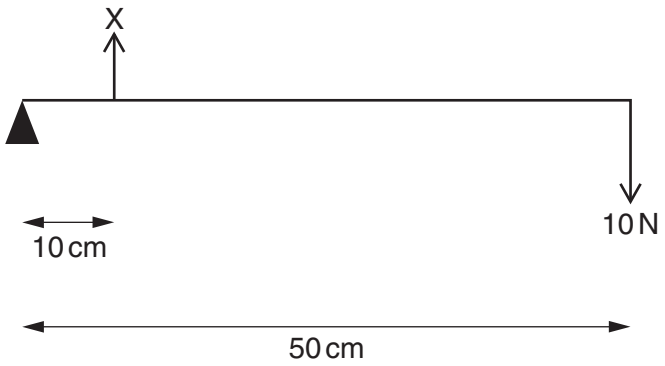
..... **[2]**

(ii) The bones in Joe's body act as levers.



Calculate the force required at X to raise the load of 10 N.
Show your working.

force = ... N **[2]**

[Total: 11]

2 Jasmine is concerned about her weight.
She uses this chart.

height cm	weight kgs																								
	45.4	47.6	49.9	52.2	54.4	56.7	59.0	61.2	63.5	65.8	68.0	70.3	72.6	74.8	77.1	79.4	81.6	83.9	86.2	88.5	90.7	93.0	95.3	97.5
152.4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
154.9	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	36	37	38	39	40
157.5	18	19	20	21	22	22	23	24	25	26	27	28	29	30	31	32	33	33	34	35	36	37	37	39
160.0	17	18	19	20	21	22	23	24	24	25	26	27	28	29	30	31	32	32	33	34	35	36	36	38
162.6	17	18	18	19	20	21	22	23	24	24	25	26	27	28	29	30	31	31	32	33	34	35	35	37
165.1	16	17	18	19	20	20	21	22	23	24	25	25	26	27	28	29	30	30	31	32	33	34	34	35
167.6	16	17	17	18	19	20	21	21	22	23	24	25	25	26	27	28	29	29	30	31	32	33	33	34
170.2	15	16	17	18	18	19	20	21	22	22	23	24	25	25	26	27	28	29	29	30	31	32	32	33
172.7	15	16	16	17	18	19	19	20	21	22	22	23	24	25	25	26	27	28	28	29	30	31	31	32
175.3	14	15	16	17	17	18	19	20	20	21	22	22	23	24	25	25	26	27	28	28	29	30	30	31
177.8	14	15	15	16	17	18	18	19	20	20	21	22	23	23	24	25	25	26	27	28	28	29	29	30
180.3	14	14	15	16	16	17	18	18	19	20	21	21	22	23	23	24	25	25	26	27	28	28	28	30
182.9	13	14	14	15	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	27	29
185.4	13	13	14	15	15	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28
188.0	12	13	14	14	15	16	16	17	18	18	19	19	20	21	21	22	23	23	24	25	25	26	26	27
190.5	12	13	13	14	15	15	16	16	17	18	18	19	20	20	21	21	22	23	23	24	25	25	25	26
193.0	12	12	13	14	14	15	15	16	17	17	18	18	19	20	20	21	22	22	23	23	24	25	25	26

underweight ideal overweight obese extremely obese

underweight = 12 – 18
normal healthy weight = 18 – 24
overweight = 25 – 29
obese = 30 – 39
extemely obese = 40+

Describe and explain how Jasmine would use this chart to assess her weight and how she could assess her weight if she did not have the chart.

The quality of written communication will be assessed in your answer.

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..... **[6]**

[Total: 6]

3 Neil falls and hurts his leg.
He goes to his local Accident and Emergency Department.
The doctor sends him for an X-ray.

(a) Look at the X-ray of Neil's leg.

What conclusions can you make about Neil's injury from the image of the X-ray?

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..... **[3]**

(b) The doctor puts Neil's leg into a plaster cast.
When it is removed, Neil goes to see a physiotherapist.

Describe what the physiotherapist does when she treats Neil's leg.

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..... **[2]**

[Total: 5]

4 Pollution in river water can be measured using indicator species.
The indicator species can be used to determine a biotic index.
The biotic index tells you how polluted the river water is.

10 = clean unpolluted water
1 = very polluted water

Look at the table of data.
It tells you how to calculate a biotic index.

	Biotic index
>10 species of stonefly larvae	>8
>10 species of mayfly larvae	8
>10 species of caddis fly larvae	7
water shrimp present but all above absent	6
water louse present but all above absent	5
blood worm present	<5

Now look at the next table of data.
It was collected by a student doing a survey of four different rivers, **A**, **B**, **C** and **D**.

	Number of species in river			
	A	**B**	**C**	**D**
species of stonefly larvae	4	11	0	6
species of mayfly larvae	7	12	0	11
species of caddis fly larvae	11	14	0	12
water shrimp present	✗	✗	✗	✗
water louse present	✗	✗	✗	✗
blood worm present	✗	✗	✓	✗
Biotic index	7	>8	<5	.....

(a) Determine the biotic index of river **D**.
Write your answer in the table. **[1]**

(b) Which river was most polluted?
To justify your answer, write down **two** pieces of evidence that affect the biotic index.

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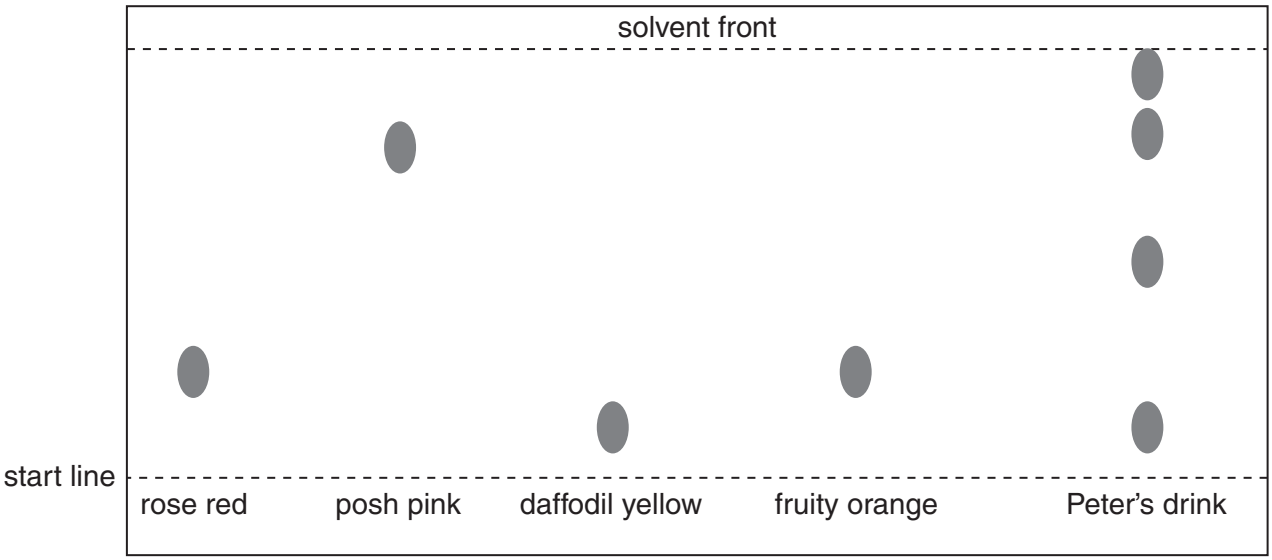
..... **[2]**

[Total: 3]

5 Peter is a student. He wants to find out which type of food colouring is used in a fruit juice that he drinks.

He makes a chromatogram of the fruit juice and four other types of food colouring.



Peter concludes that his drink contains the food colouring called posh pink.
Comment on Peter's conclusion and explain how his investigation could be improved.

The quality of written communication will be assessed in your answer.

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..... **[6]**

[Total: 6]

6 Jane is pregnant.
She has an ultrasound scan of the unborn baby (fetus).

(a) A doctor measures the distance across the fetus's skull.
This is called the biparietal diameter (BPD).
The BPD can be used to determine the gestational age of the fetus.

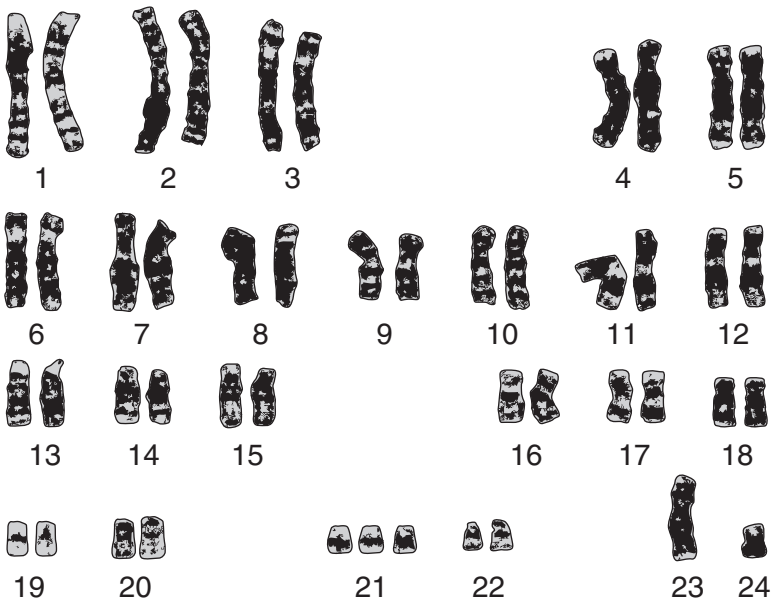
Age in weeks	BPD in mm
14	28
15	32
16	36
17	39
18	42
19	45
20	48

The scale of the ultrasound image is ×0.5.

Measure the length of the BPD and use the BPD to determine the age of the fetus.
Show your working.

age of fetus ..... **[3]**

(b) A tissue sample is taken from the fetus.
The chromosomes from a single cell of the fetus are examined by the doctor.
She notices something unusual about chromosomes 21.



Describe what is unusual about chromosomes 21 and explain the consequences of this observation.

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..... **[2]**

(c) Describe and give reasons for **one** other test that the doctor may perform on a pregnant woman.

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..... **[2]**

[Total: 7]

7 Anita works for the environment agency.
She collects samples of river water to assess their turbidity.

Describe and explain how Anita would test a sample of river water in order to assess its turbidity.

The quality of written communication will be assessed in your answer.

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..... **[6]**

[Total: 6]

8 Electrophoresis is an important technique used by forensic scientists.

(a) Which of these statements about electrophoresis are correct?

Put a tick (✓) in the boxes next to the **two** correct statements.

Electrophoresis ...

… separates substances of different colours. ☐

… uses a scanning electron microscope. ☐

… can be used on small biological samples. ☐

… can separate biological molecules. ☐

… measures the intensity of a colour. ☐

… works by increasing the resolution of an image. ☐

… uses a calibration graph to produce the result. ☐

[2]

(b) Explain how the process of electrophoresis works.

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..... **[4]**

[Total: 6]

END OF QUESTION PAPER