

Wednesday 5 June 2013 – Afternoon

GCSE ADDITIONAL APPLIED SCIENCE

A191/02 Science in Society (Higher Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

Duration: 1 hour

OCR supplied materials:
None

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, 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 bar codes.

INFORMATION FOR CANDIDATES

- Your 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 Scientists work in the National Health Service, the Food Standards Agency, the Environment Agency and the Police Force.

(a) For each of these organisations, describe the roles of the named practitioner. One has been done for you.

National Health Service

Paramedic

They are the first medically qualified people to arrive at the scene of an accident.

They administer first aid and life support before transport to hospital.

(i) **Food Standards Agency**

Public analyst

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

(ii) **Environment Agency**

Environment Officer

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

(iii) **Police Force**

Scene of Crime Officer

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

- (b) Good laboratory practice is essential for producing reliable evidence.

Students from three different schools are asked to measure the mass of a metal sample. The mass of the sample is actually $10\text{g} \pm 0.1\text{g}$. The metal sample is measured by four students in each school.

School	1st Student	2nd Student	3rd Student	4th Student
A	11.9g	12.1g	11.9g	12.2g
B	9.9g	10.1g	10.1g	10.0g
C	10.8g	11.2g	9.1g	8.9g

- (i) Which school, **A**, **B** or **C**, produced measurements that were **accurate** and also **precise**?

Explain your answer by referring to the accuracy and precision of the measurements of all three schools.

.....

 [3]

- (ii) State and explain the **type** of variation that occurred in the measurements of school **A**.

.....
 [2]

- (iii) Using only the data from school **B**, comment on the **repeatability** and **reproducibility** of the data.

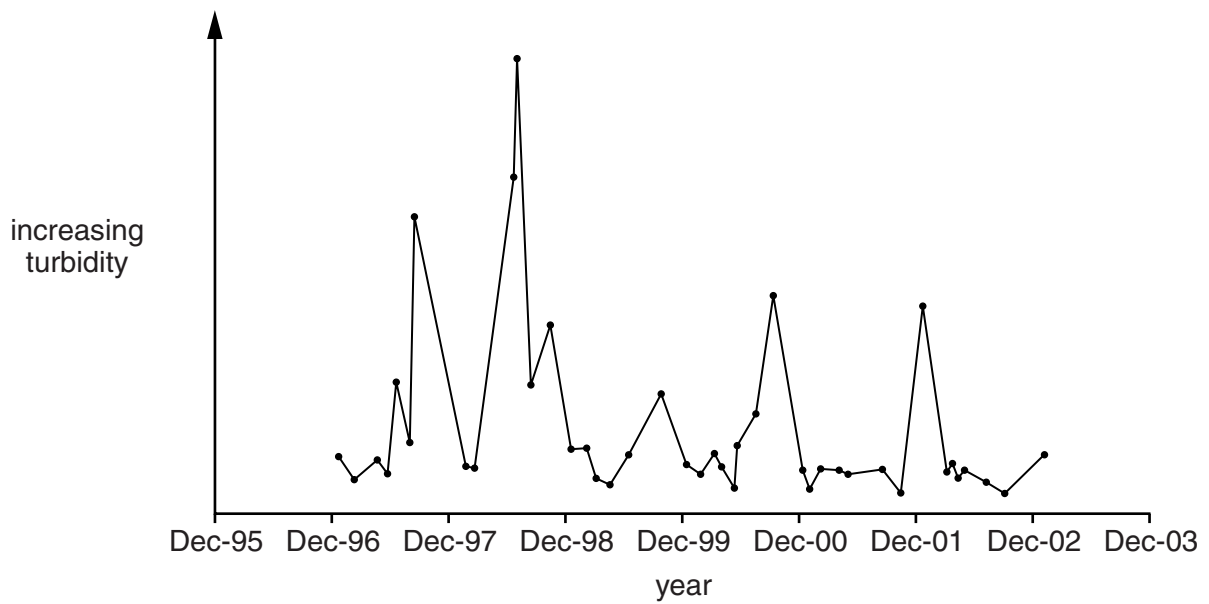
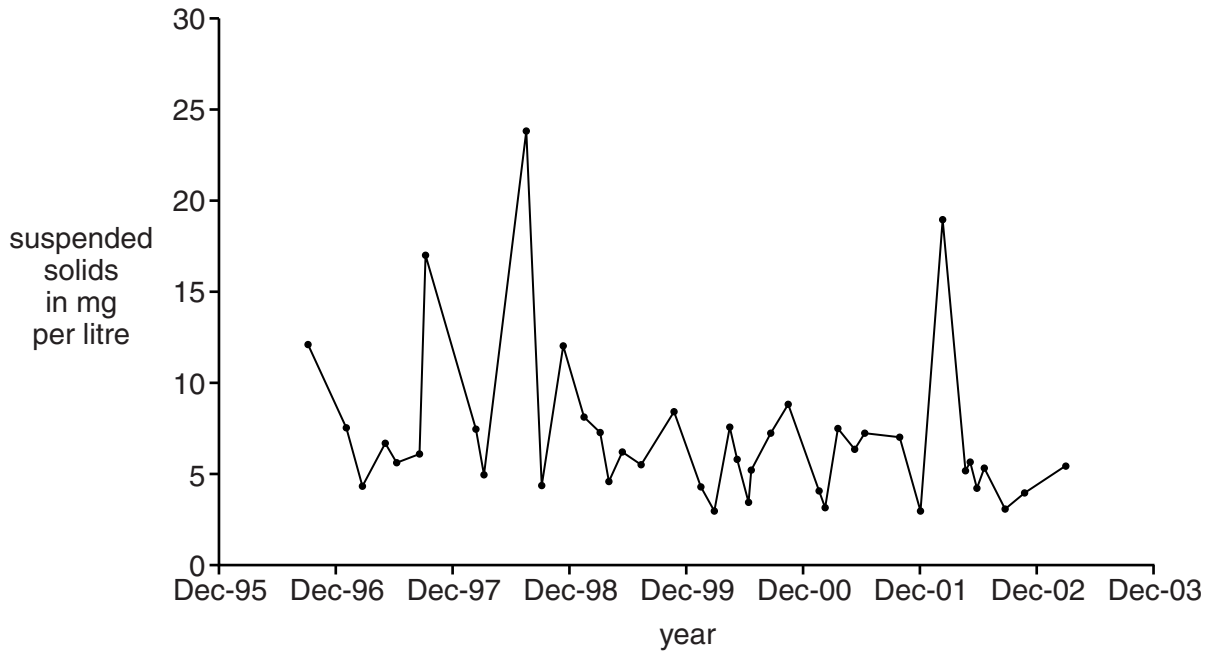
.....

 [2]

[Total: 13]

2 Water samples are taken from a river.

The graphs show the suspended solids and water turbidity of the samples.



- 3 Neil is worried about his weight. He goes to his local gym. The fitness instructor records this information about Neil.

Body Mass	102 kg
Height	1.78 m

- (a) The formula for calculating a Body Mass Index (BMI) is shown below.

$$\text{BMI} = \frac{\text{body mass (kg)}}{[\text{height (m)}]^2}$$

- (i) Calculate Neil's Body Mass Index (BMI).

Show your working. Give your answer to the nearest whole number.






BMI = [3]

- (ii) Neil goes on a diet and reduces his mass to 93 kg.

Look at the table.

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
 extremely obese = 40+

Use the table to determine Neil's new BMI chart score.

BMI = [1]

(iii) How does this change Neil's BMI category?

..... [1]

(iv) What advice should Neil's fitness instructor give him?

.....

 [2]

(b) Neil's instructor gives him a step test.

This involves Neil stepping on and off a box for 300 seconds.

The instructor takes his pulse rate three times over the next few minutes.

These are his results.

Length of Test in Seconds	Pulse Rate 1	Pulse Rate 2	Pulse Rate 3
300	128	101	82

(i) Use the formula below to calculate Neil's fitness score correct to three significant figures.

Show your working.

$$\text{fitness score} = \frac{\text{length of test in seconds} \times 100}{(\text{pulse rate 1} + \text{pulse rate 2} + \text{pulse rate 3}) \times 2}$$

Neil's fitness score = [3]

(ii) Use Neil's fitness score and this table to find his level of fitness.

Fitness Score	Fitness Level
>90	excellent
80 – 90	above average
65 – 79	average
55 – 64	below average
<55	poor

Neil's fitness level is [1]

(iii) Six weeks later, Neil's fitness score is 81.

Suggest what type of training Neil has been doing for the last six weeks and the effect it has had on his body.

.....

.....

.....

..... [3]

[Total: 14]

5 Scientists use indicators and colour test kits in their work.

- (a) Test kits may be qualitative, quantitative or semi-quantitative. Two types of indicator are **litmus** and **universal indicator**.

For each indicator write down whether it gives qualitative, quantitative or semi-quantitative results.

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

- (b) Explain the difference between a qualitative test and a quantitative test.

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

- (c) What characteristic of a solution is measured by **both** litmus **and** universal indicator?

..... [1]

[Total: 5]

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