Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Monday 6 May 2019

Morning (Time: 1 hour 30 minutes) | Paper Reference **WBI03/01**

Biology

Advanced Subsidiary
Unit 3: Practical Biology and Research Skills

You must have:
Calculator, HB pencil, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 40.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Candidates may use a calculator.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Pearson

Answer ALL questions.

1 Young fruits are unripe. As the fruits develop, they become ripe.

A student suggested that the vitamin C content of fruits increases as they become ripe.

To test this, the student carried out the following investigation:

- unripe apricots, peaches, apples and mangos were obtained
- a sample of each fruit was crushed
- each crushed sample was placed into a separate test tube
- distilled water was then added to each of the crushed samples
- each mixture was shaken and filtered to give four extracts, one of each fruit
- the vitamin C content of each extract was determined by adding it drop by drop to 1 cm^3 0.1% DCPIP solution until this solution changed colour
- this method was repeated using ripe apricots, peaches, apples and mangos.

(a) (i) State the independent variable and the dependent variable in this investigation.

(2)

Independent variable .....

.....

Dependent variable .....

.....

(ii) State **two** variables, other than the volume and concentration of DCPIP, that should be controlled in this investigation.

(2)

1 .....

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(iii) Vitamin C is water-soluble. The method used assumes that all the vitamin C from the fruit is in the extract.

Suggest how this assumption could be tested.

(3)

(b) The table below shows the results of this investigation.

Fruit	Volume of extract added to decolourise 1 cm^3 of 0.1% DCPIP / cm^3		Vitamin C content of extract / mg cm^{-3}	
	Unripe	Ripe	Unripe	Ripe
Apricot	2.6	2.1	2.3	2.9
Peach	4.0	2.4	1.5	2.5
Apple	1.6	2.4	3.8	2.5
Mango	0.5	2.2	12.0	

(i) The student found that 6 mg of vitamin C decolourised 1 cm^3 of 0.1% DCPIP solution.

Calculate the vitamin C content of the ripe mango extract.

Show your working.

(2)

..... mg cm^{-3}

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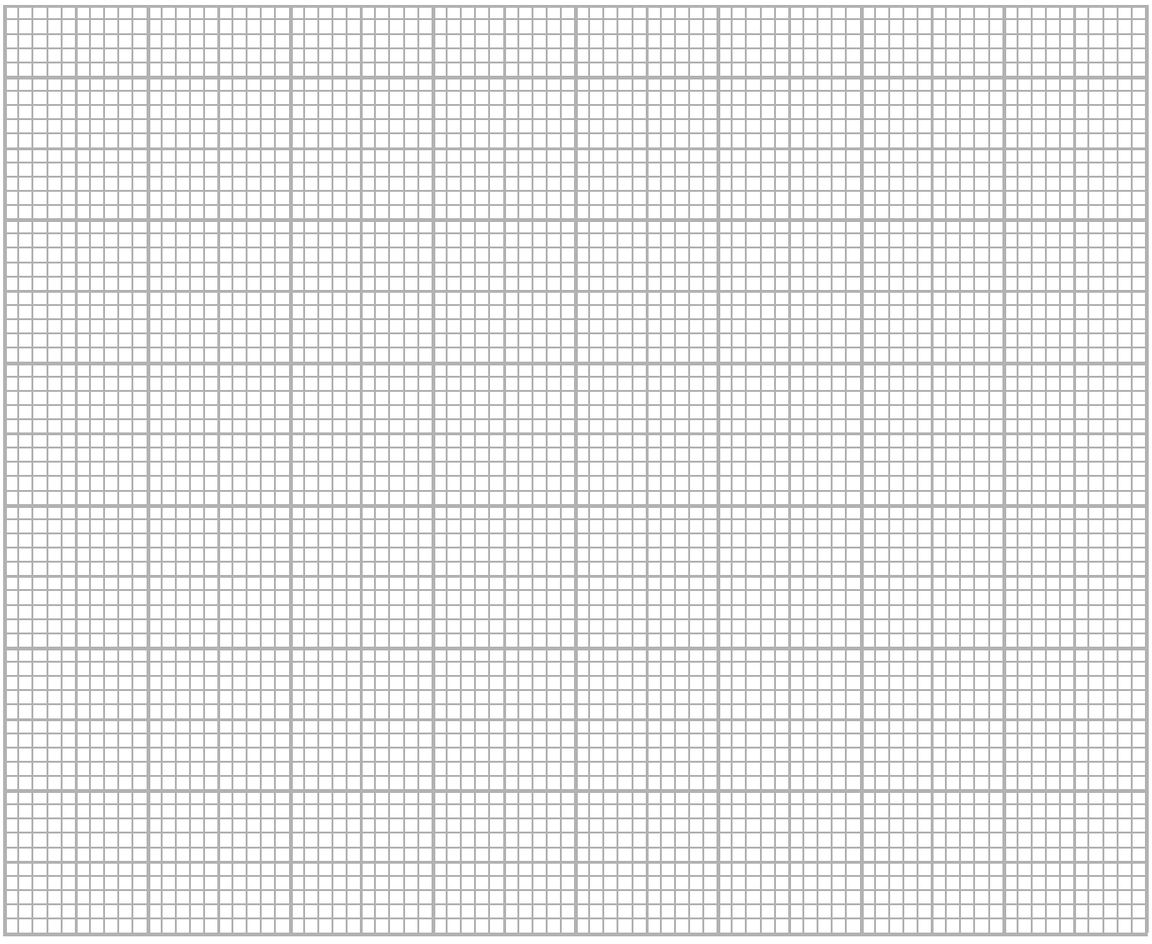
(ii) Draw a suitable graph to compare the vitamin C content of these ripe and unripe fruits.

(5)



(iii) Using the information in the table and your graph, summarise your conclusions about the effect of ripening on the vitamin C content of these fruits.

(4)

(c) Three more students repeated this investigation.

Describe how you would show the variability of all the data on a new graph.

(2)

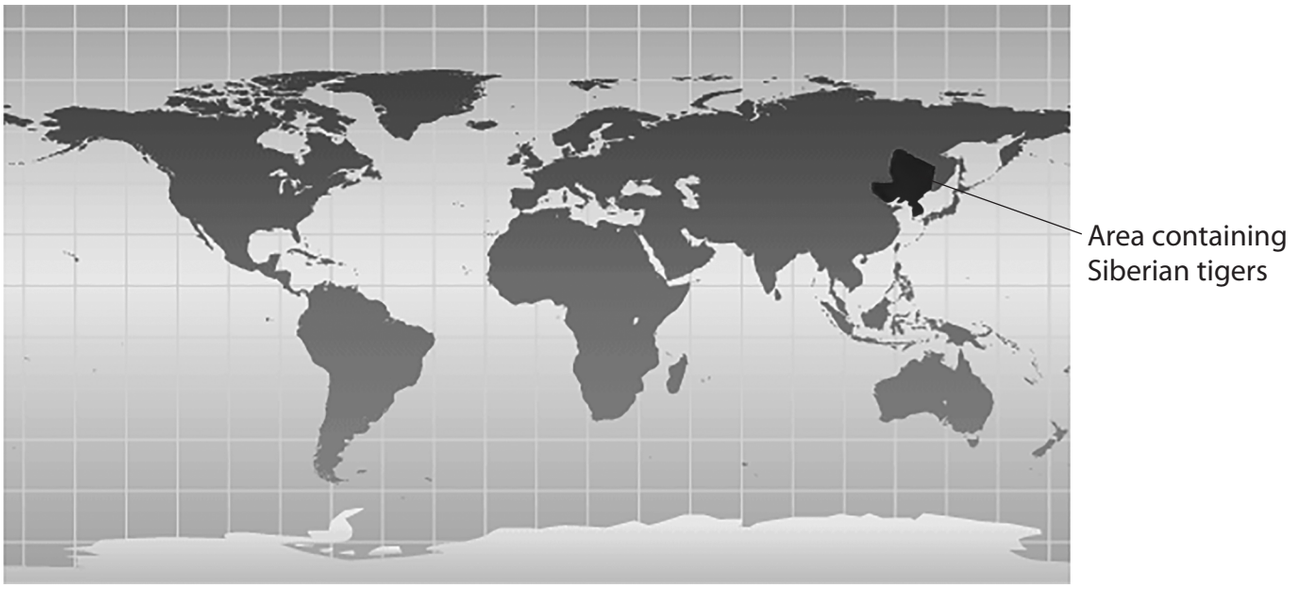
(Total for Question 1 = 20 marks)

2 Read the following account from a student's unfinished issue report on the conservation of tigers.

1. The tiger, *Panthera tigris*, is one of the species most threatened with extinction. In the last 100 years, the number of wild tigers living in Asia decreased from 100 000 to 3200.

2. Of the nine sub-species that existed at the beginning of the 20th century, three have become extinct. The Bali tiger became extinct in the 1930s, the Caspian tiger in 1950 and the Javan tiger in the 1970s.

3. The remainder are listed as endangered, with the Siberian (or Amur) tiger being one of them. Approximately 350 to 400 adult Siberian tigers live in the forests of eastern Russia and nearby northeast China and North Korea (see Figure 1). Their population trend is recorded as being stable, but it is possible they may become extinct, due to many factors. Human-tiger conflict is one of these factors.



www.animalfactguide.com

Figure 1

4. One of the main threats to tigers is poaching. A study between 1992 and 2002 found that 42% of tigers that died were poached, 33% were suspected of being poached, 8% were killed on roads and 17% died of natural causes. Tigers are killed for their skin to make fur products and for their body parts, such as bones, which are used in traditional medicine.

5. The number of humans living near tigers is increasing in many places, which results in the increase of human-tiger conflicts. Human dwellings are getting closer to the territories of the tigers, which cause this increase.

6. Roads in the habitats of the Siberian tiger also increase the number of cases in which human-tiger conflicts occur. They allow greater access for poachers, and increase deaths from collisions.

7. From 1992 to 2000, some radio-collared Siberian tigers were studied. If survival of adult females in areas with no roads is taken as 100%, it was 89% in areas with secondary roads and only 55% in areas with primary roads. For cubs, the equivalent figures were 91%, 38% and 44%. This suggests roads should be closed in all tiger habitats.

8. The hunting of elk, deer and wild boar reduces prey for Siberian tigers. The tigers may then attack livestock and domestic dogs. This also causes competition among the Siberian tigers, and they sometimes enter villages to feed themselves and their cubs. The blame is always put on the tigers for straying too close to the human dwellings, even though the root of the problem is too much hunting by humans.

9. In February 2010, in a village in Russia, a tigress killed two horses and wounded a third over two days. Her behaviour was due to lack of prey. The tiger was relocated to a place away from humans where she would not be a direct threat. She was fitted with a GPS collar that transmitted her location to a remote receiver every three hours. She was monitored for a full year without incident and she established a new home range. This case study shows that moving problem tigers is a viable method to deal with tigers entering settlements.

10. Saving the Siberian tiger helps the local economy. Many people are needed to handle tigers. Various experts, such as scientists and field workers, will be needed to run the conservation programmes.

11. Siberian tigers help to keep their habitat in favourable conditions. As top predators, they limit the numbers of herbivores, such as deer. They also maintain ecological stability by keeping the ecosystem balanced. Without tigers, too many herbivores are present, causing overgrazing and destroying the habitat. This reduces biodiversity.

12. For this reason, the Siberian tiger is important for the wellbeing of the people who depend on healthy ecosystems for food, water and many other resources, and for the survival of other wildlife, which itself relies on the balance of the ecosystem.

13. Using methods such as translocations and monitoring of Siberian tigers is an effective alternative to killing problem tigers. By moving the problem tiger to a new location, human-tiger conflicts decrease and therefore fewer tigers are killed. Humans can feel safer as they will not be in close proximity to any wild tigers.

14. Apart from the straightforward killing of tigers through human-tiger conflict, another threat to tiger populations is the loss of habitat. This makes population expansion difficult. Activities such as logging, grazing, development projects and uncontrolled fires all result in direct habitat loss. Tigers need an undamaged habitat in order to survive. Even when it is not totally destroyed, the habitat is often broken up. The habitat is divided into isolated patches, which prevent mixing of the populations. This causes the gene pool of the Siberian tiger to be extremely small. In turn, this prevents adaptation to any changes in the environment. Burned areas are also avoided as they do not provide sufficient cover for resting or hunting, nor do they provide the necessary conditions within the habitat for the prey.

(a) State the main problem identified in this report.

(1)

(b) There are two main causes of the problem identified in this report.

(i) Using information in the report, identify **one** of the causes of this problem.

(1)

(ii) Suggest **two** ways in which this problem could be reduced.

(2)

1

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(c) Sketch a visual to show the data in paragraph 7.

(3)

(d) Using the information in this issue report, explain the meaning of the term **endemism**.

(2)

(e) Paragraph 11 states that:

"Without tigers, too many herbivores are present, causing overgrazing and destroying the habitat. This reduces biodiversity".

Describe how biodiversity can be measured in a habitat.

(3)

(f) Explain why the gene pool of the Siberian tiger is decreasing (paragraph 14).

(2)

(g) Explain **one** benefit to humans of conserving Siberian tigers.

(2)

(h) The reference provided in the report about the effect of roads on tiger survival was recorded by the student as:

A paper by Linda L. Kerley, John M. Goodrich, Dale G. Miquelle, Evgeny N. Smirnov, Howard B. Quigley and Maurice G. Hornocker, which was published in a journal called Conservation Biology in 2002.

The paper was entitled Effects of Roads and Human Disturbance on Amur Tigers and was on pages 97 to 108 of part 1 in volume 6.

Using this information, write a full reference to this paper, as it should be presented at the end of the report.

Do not include the names of all the authors.

(4)

(Total for Question 2 = 20 marks)

TOTAL FOR PAPER = 40 MARKS

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