Write your name here

Surname	Other names

Edexcel GCE

Centre Number	Candidate Number

Biology

Advanced Subsidiary

Unit 3B: Practical Biology and Research Skills

Tuesday 11 May 2010 – Morning **Time: 1 hour 30 minutes**	Paper Reference **6BI07/01**

You must have:
Calculator

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.*

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.

N35856A

1/1/1/1/1/

N 3 5 8 5 6 A 0 1 1 6

Turn over ▶

edexcel
advancing learning, changing lives

BLANK PAGE

Answer ALL questions.

1 A student was interested in looking at some aspects of the efficiency of biological washing powders. These powders contain protease enzymes.
She found three sources of information about enzymes used in biological washing powders.
The first piece of information was about Savinase, which is made by a company called Novozymes®.

The extract below is taken from the Novozymes® website:

Savinase is a cost-efficient protease, effective under most alkaline conditions and is especially effective under medium-temperature wash conditions. Its optimal activity is at 55 °C.

Further information, from a paper in the Archives of Dermatological Research in 1996, said:

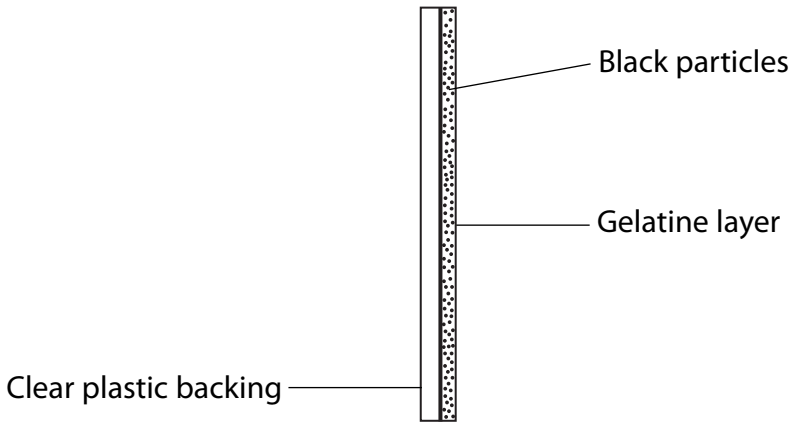
In conclusion, the present study suggests that Savinase produces blisters on the skin.

The third source of information was from a National Centre for Biotechnology Education worksheet on washing-powder enzymes:

The enzymes are coated in a low melting-point wax and are therefore safe to handle and unlikely to form airborne dust. Unnecessary contact with the dissolved enzyme should be avoided. Wash splashes with plenty of water. Spills of enzyme solution should be wiped up promptly.

Using this information, she designed some experiments. She investigated how much Savinase should be used to minimise cost but maximise efficiency in digesting protein-based stains.

Pieces of photographic film which had a layer of gelatine containing black particles were used. The gelatine (a protein) was the substrate for the enzyme. As the gelatine is digested away, the black particles fall off and the film becomes clear.



The efficiency of the enzyme was assessed by timing how long it took the film to become clear. The student carried out the experiment a number of times at each of six concentrations of the enzyme.

The results are shown in Table 1.

Table 1

Enzyme concentration (%)	**Time taken for film to become clear / seconds**												
	1	2	3	4	5	6	7	8	9	10	11	12	Mean
1.0	484	476	440	415	479	390	410	362	492	490	480	475	449
1.5	734	115	190	94	125	760	112	248	214	x	x	x	288
2.0	621	116	390	88	207	295	146	348	130	377	123	188	252
3.0	510	107	367	132	182	282	250	310	114	355	122	176	242
4.0	300	201	356	171	170	250	205	271	188	330	152	167	230
5.0	219	216	300	219	213	232	279	256	223	274	204	199	

x = no data

(a) (i) Using the information given, name **two** variables that should be controlled in this experiment. For each, suggest a suitable value for the variable.

(4)

Variable 1 .....

.....

Value .....

Variable 2 .....

.....

Value .....

(ii) Write a risk assessment for the practical work carried out. This should include suggestions of the risks and how to minimise them.

(4)

(b) (i) Using the information in Table 1, calculate the mean time taken for the film to become clear at an enzyme concentration of 5.0%.

(1)

Answer ..... seconds

(ii) The data obtained are not rates of reaction. An indication of the rate of reaction can be obtained by calculating 1÷ mean time to become clear. The table below shows 1÷ mean time for each enzyme concentration.

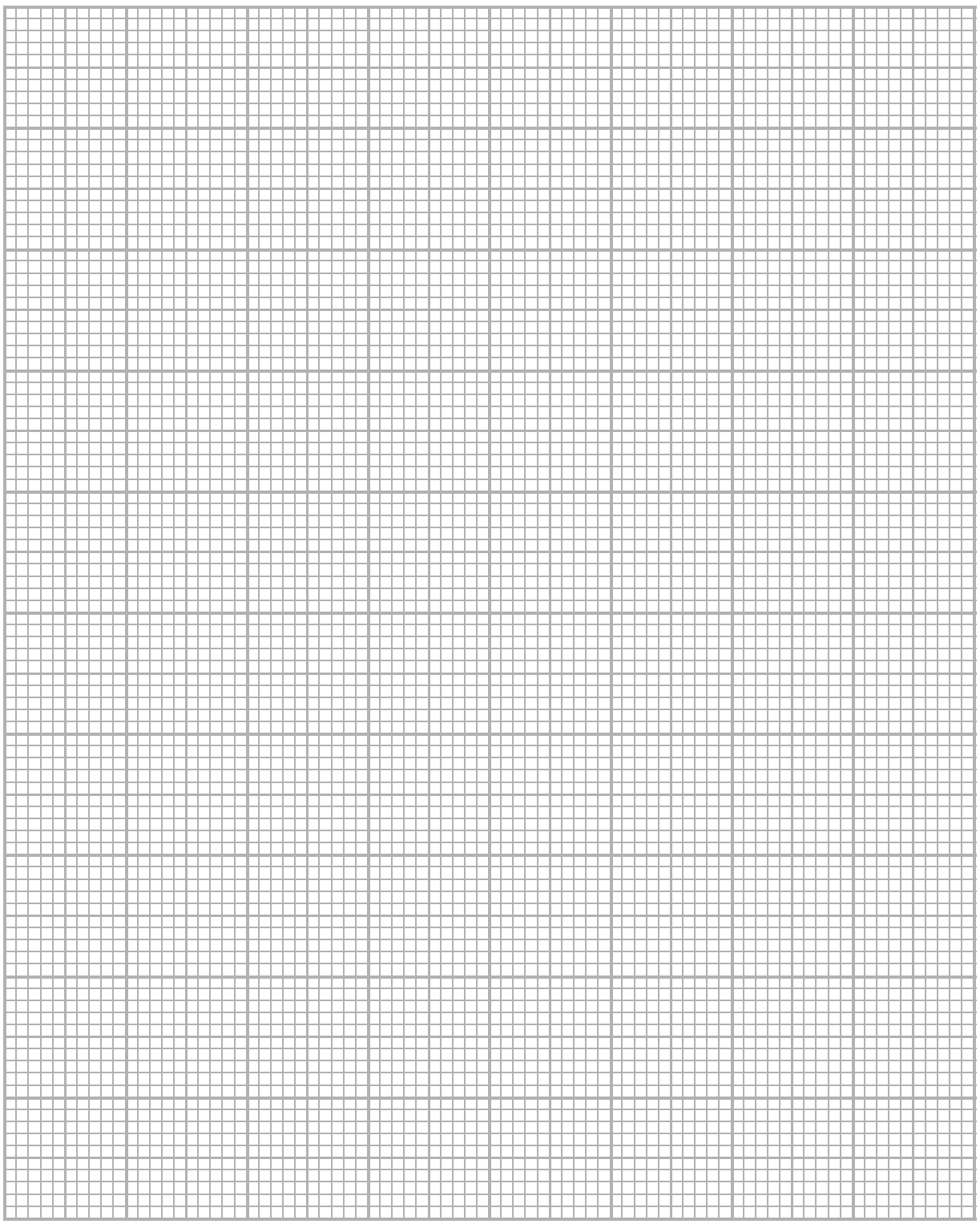
The values for 1÷ mean time are very small, so these are multiplied by 1000 to make the data easier to plot on a graph.

Table 2

Enzyme concentration (%)	1.0	1.5	2.0	3.0	4.0	5.0
(1÷ mean time) × 1000	2.2	3.5	4.0	4.1	4.3	4.2

At an enzyme concentration of 0.0% the value for 1÷ mean time is 0.
Present this information and the data in Table 2 in a suitable graphical form.

(4)



(iii) Describe and explain the shape of the graph you have plotted in (b)(ii).

(3)

(iv) Using the information in Table 1, comment on the reliability of these data.

(2)

(v) Suggest conclusions that the student could make about efficiency and cost effectiveness when using this enzyme in a biological washing powder.

(2)

(Total for Question 1 = 20 marks)

2 Read the following extract from a student's report on the topic of conservation of species by zoos.

<u>Branston zoological park</u>

Last week, we visited Branston zoological park to see some of the strategies they use when conserving wildlife. The habitats that the wildlife live in and self-sustaining populations of animals are in danger of extinction. The day was split up into different sections, and each section was given as an interactive talk with slides, photos and videos. The first talk we had was an introduction, answering questions about whether there was a need for conservation within the zoo, and also raising points like:

- Extinction – was there still a problem with animals being close to extinction?
- Threats – were there animals under serious threat from lots of different factors?
- Pollution – was pollution having an effect on the above?
- Hunting – was there as much hunting of animals for only their valuable parts?

All these points were raised and discussed. To most of these questions the answers were yes, however they were not as 'strongly' a yes as about 30 years ago. The number of species that are under threat has gone down because of zoos like Branston zoo. For example, the zoo uses computers to store the same information that at the moment is entered into a stud book, but just electronically. They also use genetic fingerprinting to keep records of each animal. These developments are to conserve the wildlife and to make sure that species don't become under threat or too close to extinction. Another development would be to maintain genetic variation.

Our next talk was about the role of zoos in conservation breeding. In this talk, they were discussing their conservation objectives and how their aim was to conserve 90% of genetic variation in the zoo's populations. At the moment, they are predicting that they can achieve 90% over the next 100 years. However, they are aiming to improve this to 90% over the next 200 years. After this they explained the aims of captive breeding:

- Conserving genetic variation.
- Maintaining healthy, self-sustaining populations so the species do not become extinct.

Trying to restock the wild is costly to the economy, flawed and impractical. This is because there are so many variables in the wild which are too hard for us to keep constant. Animals should be conserved in the wild, therefore protecting not just single species – like zoos do – but whole ecosystems. Very large amounts of money are used to keep and breed animals in captivity. This money could be used for conservation in the wild, protecting both the animals and their habitat, thus showing us the importance of conservation.

Money could be spent in other areas:

- Establishing protected reserves: animals should be kept as near as possible to their natural habitat.
- Funding anti-hunting patrols.
- In education: by educating local people to value and protect their wildlife and teaching them the importance of conservation.
- Lobbying for laws to protect wildlife: to stop wild animals being killed for fur, ivory, horn, or using their body parts for medicines, ornaments and sporting trophies.

Another interesting thing they mentioned was about keeping records by storing blood samples. Well, this would be a very good idea; especially now that our knowledge of DNA is becoming ever better and well known. Maybe the idea of DNA fingerprinting would be a good idea because this would mean instead of assigning number codes to different animals they could all have their own unique DNA fingerprint.

The zoo is thinking about building five more natural enclosures for their tigers. Their reasoning behind all of their future developments is this:

- They are committed to the continuing development of their enclosures to provide the highest possible quality of life to their animals.
- They believe that the educational experience of their visitors can be enhanced by seeing animals in environments that replicate the animals' natural habitat.
- They aim to promote awareness of the threats that endangered animals face in the wild and assist in the conservation of these species.
- They hope that these new enclosures will encourage their visitors to take an active role in conservation.

Bibliography

1. Notes from our visit to Branston zoo – most of the information in this report was taken from my notes when we visited Branston zoo.
2. Worksheets we were given at Branston zoo – also where most of the information in this report was taken from.
3. Internet – www.branstonzoo.com – just some background information to back up my statements and my information.

(a) The student's teacher suggested that the report needed some data and graphs to illustrate some of the points. The student did a web search and found two sources of information: the International Union for the Conservation of Nature (IUCN) and Wikipedia.

He put this information in the following table.

Year	Number of species threatened worldwide	Source of information
1990	4477	IUCN red list 1996
1994	5929	IUCN red list 1996
1996	5205	IUCN red list 1996
2006	16118	Wikipedia article
2007	16306	Wikipedia article
2008	16928	IUCN leaflet released 2008

(i) Suggest a suitable title for this table.

(1)

.....

.....

.....

(ii) Suggest how you would investigate the validity of these sources of information.

(2)

.....

.....

.....

.....

.....

.....

(iii) The student suggested inserting this table in his report to support the statement in lines 12–13. Does this table support the statement in lines 12–13? Give reasons for your answer.

(3)

N 3 5 8 5 6 A 0 1 1 1 6

(b) There is a suggestion in the report (at lines 30–39) that money spent on conservation breeding could be better spent on the conservation of wild habitats. In his search for data to support these views, the student came across a paper in which the views of 2000 households had been recorded. They were asked what they thought was the main reason for the loss of species.

The answers are summarised in the table below.

Reason for loss of species	Percentage of households (%)
Habitat loss	55
Toxic chemicals	36
Hunting	7
Introduced species	2

(i) Produce a sketch, in the space below, to show these data in a suitable visual form.

(2)

(ii) Does the information in the table on page 12 show that the majority of people would agree with the views expressed in lines 30–39?
Explain your answer.

(3)

(c) Suggest how the bibliography should be changed if these two tables of data used by the student were now included in the report.

(4)

(d) The suggestions in lines 20–30 address implications of the conservation breeding approach to saving species. A visit/issue report is expected to address two implications: ethical, social, economic or environmental.

(i) Give the **one** implication addressed in lines 20–30.
Explain your answer.

(2)

.....

.....

.....

.....

.....

(ii) For another **one** of the ethical, social, economic and environmental implications, give a line number that refers to it.
Explain why it is an example of this type of implication.

(3)

Implication .....

Line number .....

Explanation .....

.....

.....

.....

(Total for Question 2 = 20 marks)

TOTAL FOR PAPER = 40 MARKS

BLANK PAGE

BLANK PAGE