Write your name here

Surname	Other names

Edexcel GCE

Centre Number	Candidate Number

Biology

Advanced Subsidiary

Unit 3B: Practical Biology and Research Skills

Tuesday 17 May 2011 – Afternoon
Time: 1 hour 30 minutes

Paper Reference
6BI07/01

You must have:
Ruler, Calculator, HB pencil

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.

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Answer ALL questions.

1 Plant fibres have been used for thousands of years to make clothing, paper and rope. The tensile strength of fibres such as hemp and sisal is sufficient for these materials.

The breaking force of plant fibres can be measured by applying a force until the fibre breaks. Tensile strength, expressed in units called pascals, can be calculated from the breaking force.

One pascal (Pa) is equal to a force of one newton per square metre.

It is possible that adding alkali will increase the tensile strength of these fibres so that they can be used in new materials.

An investigation was carried out to study the effect of sodium hydroxide (NaOH) on the tensile strength of hemp and sisal fibres.

Thirty fibres were soaked in distilled water and the breaking force of each fibre was measured in newtons. The breaking force (N) was then converted into tensile strength (Pa) and recorded.

This was repeated with fibres soaked in different concentrations of NaOH.

(a) (i) Name the variable that must be measured to convert the breaking force (N) into tensile strength (Pa).

(1)

.....

(ii) State the **dependent** variable in this investigation.

(1)

.....

(iii) Give **two** variables to be controlled in this investigation. Describe how they could be controlled.

(4)

Variable 1 .....

How it could be controlled .....

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.....

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Variable 2 .....

How it could be controlled .....

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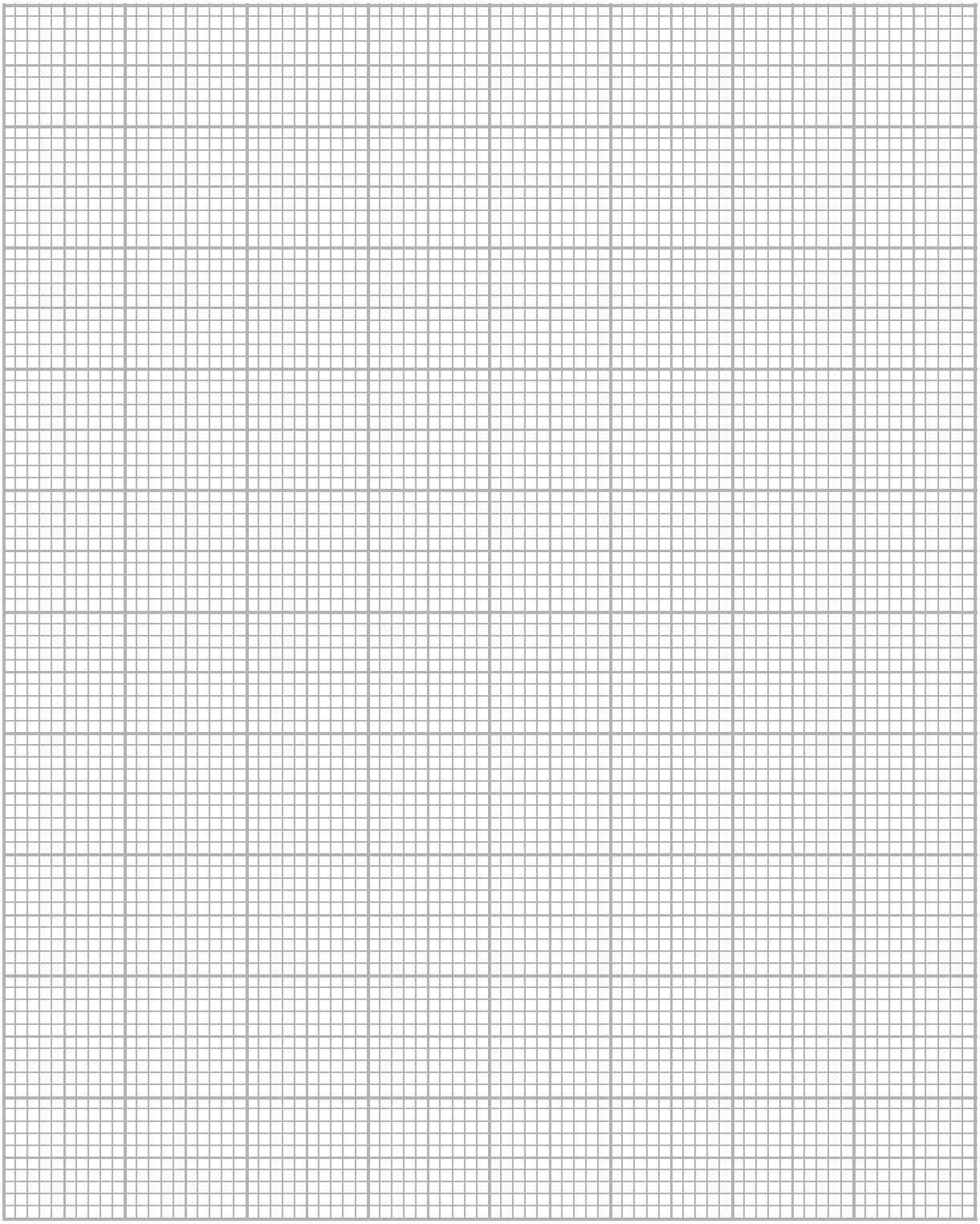
(b) (i) The results of an investigation using sisal fibres are shown in the table below (1 MPa = 1 million pascals).

Sodium hydroxide concentration (%)	**Mean tensile strength / MPa**
0.00	395
0.04	425
0.08	540
0.16	820
0.24	590
0.32	620

Plot the data from the table, in a suitable graphical form.

(4)



(ii) Describe the effects of sodium hydroxide concentration on the tensile strength of sisal fibres.

(3)

(c) The experiments were repeated using hemp fibres. The results are shown in the table below.

Sodium hydroxide concentration (%)	Mean tensile strength / MPa	Standard deviation / MPa
0.00	594	106
0.04	603	71
0.08	650	97
0.16	916	141
0.24	1074	185
0.32	969	118

(i) State **one** similarity and **one** difference in the conclusions you could make about the effect of sodium hydroxide on the tensile strength of sisal and hemp fibres.

(2)

Similarity

Difference

(ii) Comment on the reliability of the data for **hemp** fibres and explain how this affects your confidence in any conclusions drawn.

(3)

(iii) Plant fibres treated with sodium hydroxide could be used to reinforce new materials.

Using the data given, suggest which of these two fibres is more suitable for reinforcing new materials. Give an explanation for your answer.

(2)

(Total for Question 1 = 20 marks)

2 The following is an extract from a student's report on the topic of the Madagascan periwinkle and childhood leukaemia, a blood disorder.

The Madagascan periwinkle and the treatment of childhood leukaemia

The Madagascan periwinkle is a plant native to the rainforests of Madagascar. This large island is situated in the Indian Ocean off the east coast of Africa and has a warm tropical climate, ideal for this species. However, much of this rainforest has been lost along with other useful species.

This plant has been used for treating a wide range of illnesses. For example for many centuries in Europe, the plant was believed to be the cure for diabetes and in the Caribbean they used an extract from the periwinkle to help treat eye infections. In South America the plant was also used as a remedy to ease sore throats and congested lungs, and in India to treat venomous stings. The discovery of the anti-cancer properties of the Madagascan periwinkle began when the United States Cancer Institute started a large scale plant screening in the 1950's. Eli Lilly, a pharmaceutical company, became interested and looked into the Madagascan periwinkle in greater depth.

Researchers, looking for a cure for diabetes, tested extracts from the plants. They found the extracts did not help people with diabetes. However chemicals within the plant did reduce the number of white blood cells, with no side effects.

More recently the Madagascan periwinkle was found to contain two alkaloids in its leaves, vinblastine and vincristine, which have been discovered to be anti-cancer agents. Vincristine has been used in chemotherapy for childhood leukaemia since the 1960s. Its use is regarded as one of the main breakthroughs in cancer research in recent years. Vinblastine is being used to treat Hodgkin's disease which is one of a group of cancers called lymphomas.

This plant is now grown all over the world to be used as a resource in cancer therapy. Worldwide sales of the Madagascan periwinkle amount to $100 million annually, none of which goes to Madagascar where the plant originated. However recent international talks mean that more profits from the commercial expansion of animal and plant species will return to the source. The rules for collecting species have changed. For the first time in history, collectors are expected to compensate source countries, thanks to the Convention on Biological Diversity (CBD), signed at the 1992 United Nations Conference on Environment and Development in Brazil. The CBD was drafted in response to concerns by international organisations and governments about the loss of global biodiversity and the need for equitable sharing of benefits from collecting species.

Leukaemia is a type of cancer. In children the disease is most commonly contracted between ages 2 and 8. 30% of cancers in children are leukaemias. Leukaemia refers to cancer of the blood cells or bone marrow, most commonly the white blood cells, where they can divide uncontrollably. Leukaemia results in large amounts of abnormal white blood cells being produced in the bone marrow. These white blood cells then overflow into the blood stream. The white blood cells are abnormal as they cannot perform their job of defending against diseases efficiently.

As time goes on and the cancer spreads, it can affect other processes in the body. It can reduce the numbers of platelets and red blood cells being produced in the bloodstream and result in anaemia. Due to white blood cell deficiency there is an increased risk of infection.

Acute and chronic are the two types of leukaemia. The acute type is the rapidly developing cancer which amounts to 98% of child leukaemias. The chronic type is the slow developing form of leukaemia where the excessive build up of abnormal blood cells can take months or even years. This type is very rare in children but more common in adults. There are two types of acute childhood leukaemias, acute lymphocytic leukaemia (ALL) and acute myelogenous leukaemia (AML). Rates of surviving ALL have risen in the last 35 years from 10% to nearly 80% due to new drugs, such as those from the periwinkle, and medical care, as well as awareness of symptoms.

The success of treatment for leukaemia depends on the type and stage of the leukaemia. Acute leukaemia often goes into remission (the symptoms leave and the disease is under control but not cured). Lots of people in remission from acute leukaemia can have a deterioration (the disease returns).

More research has gone into investigating the causes and the treatment of leukaemias. There have been brilliant breakthroughs e.g. Madagascan periwinkle. No doubt the treatment and research will continue to have high-quality results in helping to save more and more lives around the world.

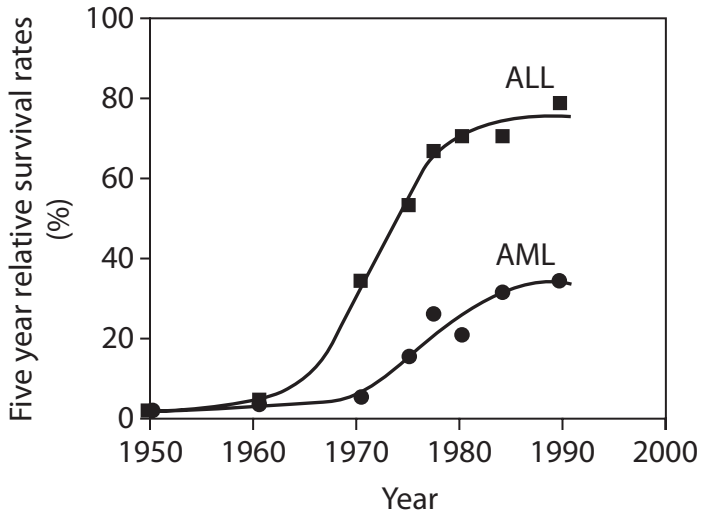
Reference List

- Cyberbotanica website
- The living rainforest website
- Wikipedia website

(a) The student identified childhood leukaemia as a problem. Explain why childhood leukaemia is considered to be a problem.

(3)

(b) The student needed data to support some of the statements she had made. She found this graph on a website showing changes in survival rates in children suffering from ALL and AML over 40 years up until 1990.



(i) Suggest a suitable title for this graph.

(2)

(ii) Suggest where in the report you would put this graph. State the line number and give a reason for your choice.

(2)

Line number .....

Reason .....

(c) A visit or issue report is expected to address two of the following implications: ethical, social, economic or environmental. Identify, using line numbers, **two** of these implications from this report. Explain why you have chosen each implication.

(4)

Implication 1 .....

Line number .....

Explanation .....

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Implication 2 .....

Line number .....

Explanation .....

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(d) The student's report states that "research will continue to have high-quality results in helping to save more and more lives around the world."

When updating the article the student found the following data to support her statement.

Year	Survival rate of patients (%)				
	ALL	AML	Hodgkin's disease	Bone cancer	Brain tumours
1950	4	0	40	20	17
1970	50	5	90	38	24
1990	75	37	92	62	58
2010	90	60	92	63	70

(i) Explain how the data in the table supports her statement.

(3)

(ii) The student decided to compare the percentage survival rates in 1950 with 2010, using a graph. Describe a suitable graphical form for the data.

(2)

(e) One of the comments of the student's teacher was that the references could be improved.

(i) Give **two** ways in which the student's references could be improved.

(2)

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(ii) Identify, using a line number, one place in the report which requires a reference to support the statement made. Give a reason for your answer.

(2)

Line number .....

Reason .....

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(Total for Question 2 = 20 marks)

TOTAL FOR PAPER = 40 MARKS

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