Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use Total EMPA mark	
Examiner's Initials	
Section	Mark
Task 1	
Task 2	
Section A	
Section B	
TOTAL EMPA MARK	

General Certificate of Education
Advanced Subsidiary Examination
June 2010

Human Biology HBI3X

Unit 3X AS Externally Marked Practical Assignment

Written Test

For submission by 15 May 2010

For this paper you must have:
- Task Sheet 2, your results and your graph
- a ruler with millimetre measurements
- a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 30.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use scientific terminology accurately.

Section A

These questions relate to your investigation of the cell cycle and the different stages of mitosis.

Use your Task Sheet 2, your results, processed data and your graph to answer the questions.

Answer **all** questions in the spaces provided.

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6 In Task 1, human tissue was not used.
Give **two** reasons why human tissue was not used.

1 .....

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(2 marks)

7 In Task 2, the prepared slide that you used was a longitudinal section of a root tip.
What is meant by a *longitudinal* section?

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(1 mark)

8 (a) Which stage of mitosis, prophase, metaphase, anaphase or telophase, did you find takes the longest time to complete?
Suggest how the events that occur during this stage result in it taking the longest time to complete.

Stage .....

Suggested explanation .....

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(3 marks)

(Extra space) .....

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8 (b) The nuclei of many cells in interphase appear to be unevenly stained.
Explain why they appear to be unevenly stained.

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(2 marks)

9 How did you decide how many cells to count?

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(1 mark)

10 In Task 2, you assumed that one complete cell cycle takes 720 minutes.
A scientist studying onion root tips found that the time taken for mitosis was about 80 minutes.
She recognised that the proportion of 80 minutes that a stage of mitosis took to complete could be found from the percentage of cells that were in that stage of mitosis.
She used this to calculate the time in minutes for each stage of mitosis.

10 (a) Use the scientist's method to complete the table.

Stage of mitosis	Number of cells in stage of mitosis	Percentage of cells in stage of mitosis	Time to complete stage of mitosis / minutes
Prophase	108		
Metaphase	16		
Anaphase	8		
Telophase	28		

(2 marks)

10 (b) Describe the similarities and differences between the times you obtained for each stage of mitosis in your investigation with the results you have calculated in this table.

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(2 marks)

10 (c) Was the method you used to find the time taken to complete each stage of mitosis more reliable than the one that the scientist used?
Explain your answer.

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(2 marks)

15

Resource Sheet

Introduction

During growth, mitosis occurs rapidly and new cells are produced. Mitosis is a controlled process but sometimes abnormal cells develop that divide out of control. Uncontrolled mitosis results in the formation of a mass of cells called a tumour. If the cells in the tumour are malignant, the tumour is a cancer.

Resource A

A scientist studied the mean times required for healthy stomach cells and stomach cancer cells to complete stages of the cell cycle.

The results are shown in **Table 1**.

Table 1

Stage of cell cycle	Mean time for stomach cells to complete stage of cell cycle / minutes	
	Healthy cells	Cancer cells
Interphase	527	378
Prophase	58	44
Metaphase	9	8
Anaphase	4	3
Telophase	11	9

Resource B

Vinblastine is a drug that kills cancer cells as they divide. It is particularly effective during metaphase. Like other drugs used against cancer, it is not just specific to cancer cells. It kills healthy cells as well.

Scientists studied the effects of low and high doses of vinblastine on a type of malignant tumour. They measured how much the drug affected tumour growth and blood flow through the tumour compared with an untreated tumour.

Some of the results are shown in **Table 2**.

Table 2

Vinblastine dose	Mean slowing of tumour growth / arbitrary units	Change in blood flow through the tumour
Low	1.1	effect not noticeable
High	2.1	noticeable effect

Turn over ▶

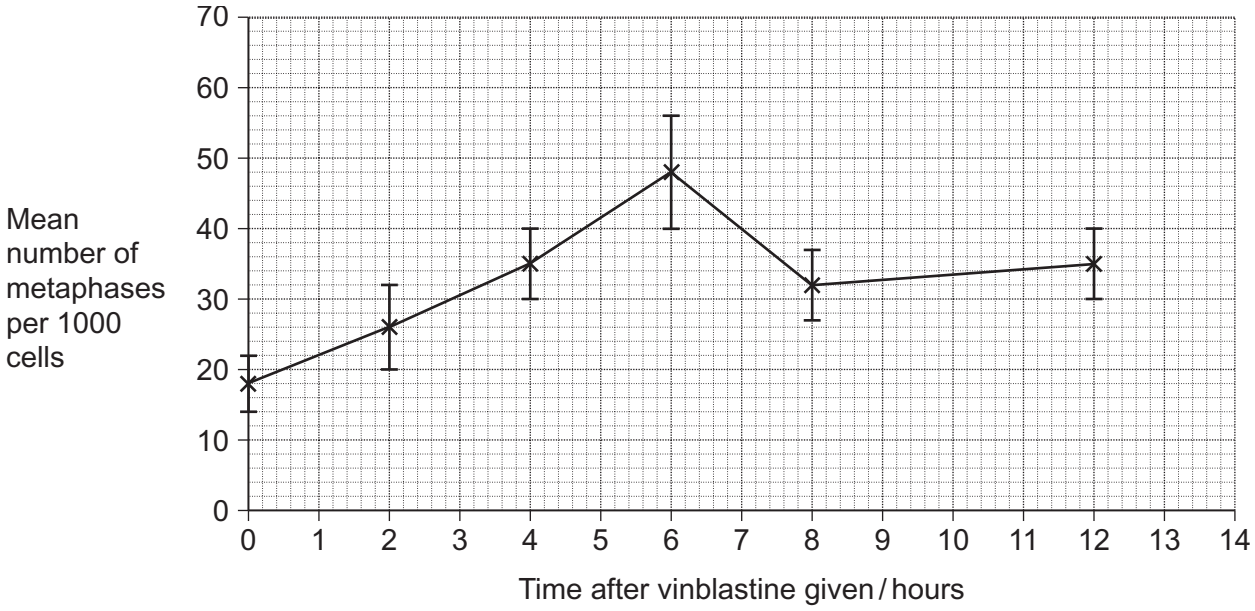
Resource C

Researchers studied the effect of vinblastine on the rate of mitosis. Patients with one form of mouth cancer were given a single dose of vinblastine. The researchers then examined samples of tissue from the cancer.

They recorded the mean number of metaphases per 1000 cells at regular intervals.

The results are shown in **Figure 1**. The bars show the standard deviations.

Figure 1



Section B

Use the information in the **Resource Sheet** to answer the questions.

Answer **all** questions in the spaces provided.

Use the information provided in **Resource A** to answer the following questions.

11 (a) Give **three** conclusions that you can draw from the data in **Table 1** about the similarities and differences in the cell cycle of these two groups of cells.

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(3 marks)

(Extra space) .....

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11 (b) Use the data in **Table 1** to explain the rapid growth of the cancer.

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(2 marks)

Turn over ▶

Use the information provided in **Resource B** to answer the following questions.

12 Explain how a 'noticeable effect' on blood flow through the tumours slowed their growth.

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(3 marks)

(Extra space) .....

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13 The scientists studied the effects of different doses of vinblastine on malignant tumours. Explain why the results of their investigation would be important to doctors who treat cancer.

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(2 marks)

Use the information provided in **Resource C** to answer the following questions.

14 (a) The rate of mitosis is given as the mean number of metaphases per 1000 cells. Explain the change in the mean number of cells in metaphase over the first six hours.

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(3 marks)

(Extra space) .....

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14 (b) Some doctors were shown the results of this research. They concluded that, on the basis of these results, vinblastine was not a good drug to treat this type of tumour. Evaluate this conclusion.

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(2 marks)

15

END OF QUESTIONS

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