INTERNATIONAL BACCALAUREATE

BIOLOGY

Subsidiary Level

Cand. ref. no.

Paper 2   Monday, 14 May 1990 (afternoon)   45 minutes

INSTRUCTIONS

This paper contains TWO questions and you should attempt them both. Write your answers in the spaces provided in this question book.

Graph paper is required.

This paper consists of 5 pages.   TURN OVER

Question 1

The rate of respiration of an organism can be calculated from the changes in the quantities of carbon dioxide (CO_2) or oxygen (O_2) in a closed system, per unit of time. The volume changes of the gases are recorded in a piece of equipment called a volumeter. As CO_2 and O_2 are gases, a correction factor has to be applied for the changes in temperature and atmospheric pressure that occur during the experiment. A separate piece of equipment, called a thermobarometer, is used to provide this correction factor.

An experiment was performed to determine the rate of respiration of some germinating seeds. Two volumeters were used simultaneously, volumeter A with the seeds and a CO_2 absorber and volumeter B with the seeds only. The changes in the volume of the gases, expressed in microliters ($\mu\ell$), were recorded in the following table.

Time/ minutes	Volume changes ($\mu\ell$)				
	Thermobarometer	Volumeter A		Volumeter B	
		observed	corrected	observed	corrected
0	0	0		0	
2	2	-15		2	
4	4	-30		3	
6	5	-45		5	
8	9	-60		10	
10	10	-74		10	
	column 1	column 2	column 3	column 4	column 5

(a) On the graph paper provided, plot a graph showing the volume changes for the thermobarometer and volumeter A (column 1 and 2).

(2 marks)

(b)   Complete the data table for volumeter A and volumeter B by applying the
      thermobarometer correction factor and completing columns 3 and 5.
                                                              (2 marks)

(c)   How would you determine the total carbon dioxide produced in the 10
      minutes of the experiment?   *(2 marks)*

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(d)   Determine the amount of oxygen used in volumeter A between 6 minutes
      and 8 minutes. Show your calculation.   *(1 mark)*

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(e)   Using this information, calculate how much oxygen would be consumed in
      an hour by these seeds under these experimental conditions. Show your
      calculation.
                                                              (1 mark)

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(f)   Calculate the respiratory quotient (RQ) for these seeds.
                                                              (2 marks)

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Question 2

John and his wife Mary show normal skin pigmentation. John is the son of a normally pigmented father and an albino mother. Mary is the daughter of a normally pigmented mother and an albino father.

John and Mary have three children: two sons, Peter and Paul, and one daughter, Susan. Peter is an albino, but Paul and Susan show normal skin pigmentation.

(a) Show inheritance of albinism in this family by drawing a Pedigree
     Chart.   *(1 mark)*

(b) Is albinism dominant or recessive?   *(1 mark)*

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(c) Show the possible genotypes of <u>John</u>, <u>Mary</u> and their <u>son Peter</u>. Use
     appropriately chosen symbols to represent the alleles for "normal skin
     pigmentation" and "albinism".   *(3 marks)*

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(d) What is the probability that Mary and John will have another
     <u>albino son</u>? Show your calculations.   *(2 marks)*

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(e) From the information given can you determine the genotype of <u>Mary's</u>
     <u>mother</u> and <u>John's father</u>? Explain your answer.   *(1 mark)*

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(f) What is the probability of <u>Susan</u> having albino children if she were to
     marry an albino man? Show your calculation.   *(2 marks)*

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