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Bachillerato Internacional

BIOLOGY
HIGHER LEVEL
PAPER 2

Monday 17 May 2010 (afternoon)

2 hours 15 minutes

Candidate session number

0	0								

INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer two questions from Section B. Write your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.

0110

SECTION A

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

1. Migrating birds must refuel along the way in order to continue flying. A field study was conducted among four different species of migrating birds known to stop at high quality and low quality food sites. Two techniques were used to assess food quality in the stopover sites. Birds were captured and weighed at the two sites. Blood samples were taken from the birds to determine nutrient levels in their blood. The two techniques were compared for their effectiveness.

    The table below shows data collected from the two sites during one season.

Species	Site 1		Site 2	
	N (number captured)	Mean bird mass / g	*N* (number captured)	Mean bird mass / g
Hermit thrush	46	29.8	28	28.3
White-throated sparrow	47	27.9	48	27.2
American robin	8	78.3	10	77.6
Magnolia warbler	30	8.4	10	8.2

[Source: adapted from C Guglielmo, *et al*., (2005), *Physiological and Biochemical Zoology*, **78**(1), pages 116–125]

(a) Considering all the birds sampled, identify which species was sampled the most and which was sampled the least. *[1]*

Most: . . . .

Least: . . . .

(b) Using the data from the table, calculate the percentage difference in mean bird mass for the hermit thrushes refueling at Site 1 compared to those refueling at Site 2. *[1]*

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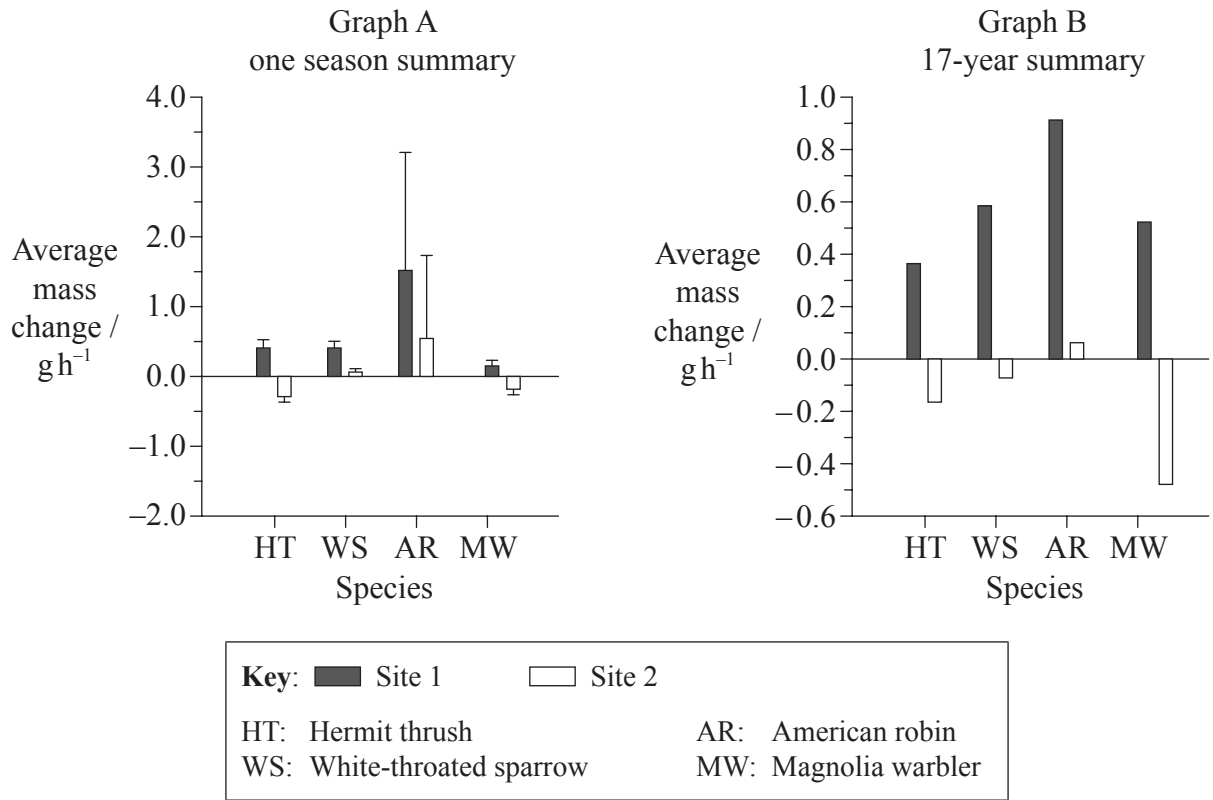
(This question continues on the following page)

(Question 1 continued)

A method was used to determine the average mass change in grams per hour $(g\,h^{-1})$ during the study. Graph A represents a summary of data collected during one season whereas Graph B represents a summary of data collected over 17 years.

[Source: adapted from C Guglielmo, *et al.*, (2005), *Physiological and Biochemical Zoology*, **78**(1), pages 116–125]

(c)   Compare the 17-year summary data for the hermit thrush and the magnolia warbler.   *[2]*

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(d)   Evaluate the one season data for the hermit thrush and the American robin with regard to average mass change per hour at Site 1.   *[2]*

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(Question 1 continued)

Among birds, high triglyceride concentration in blood plasma indicates fat deposition whereas high butyrate concentration in blood plasma indicates fat utilization and fasting. The following data summarizes triglyceride levels and butyrate levels measured for the same groups of birds.
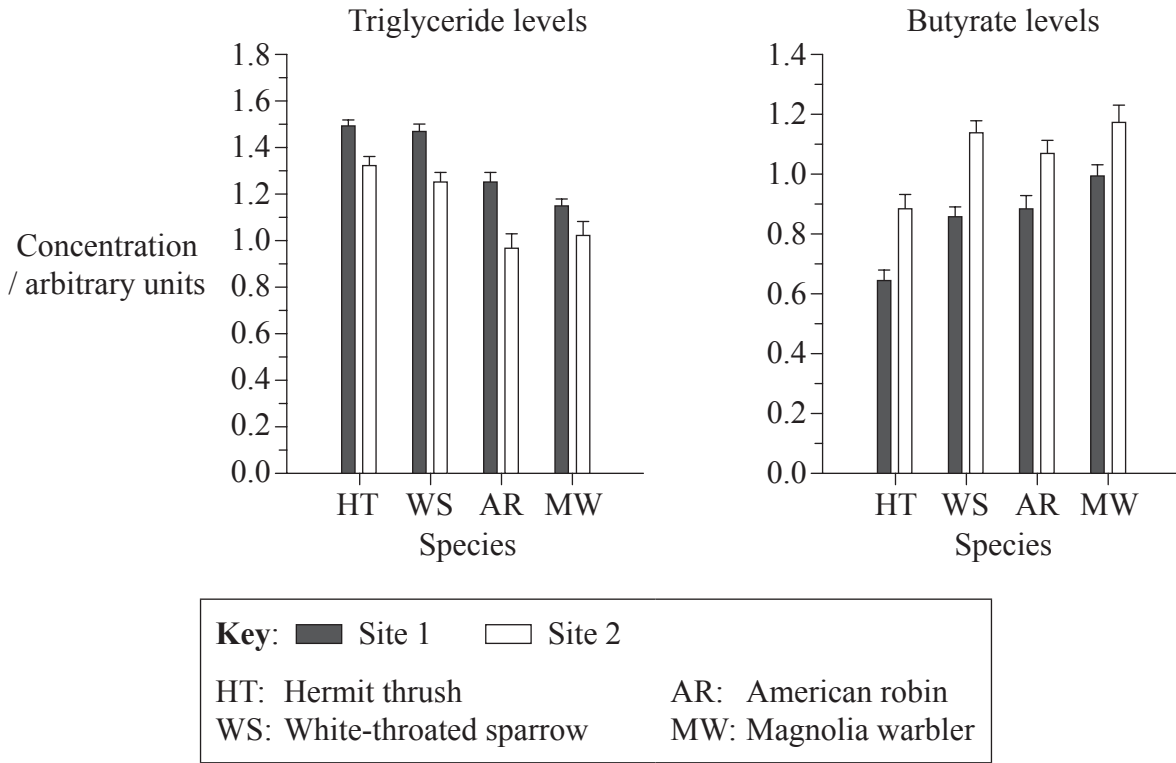
[Source: adapted from C Guglielmo, *et al.*, (2005), *Physiological and Biochemical Zoology*, **78**(1), pages 116–125]

(e)   Describe, using the triglyceride levels graph, the results at Site 1 and Site 2 for all of the birds. *[2]*

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(This question continues on the following page)

(Question 1 continued)

(f) Explain the differences in the triglyceride level and butyrate level for the hermit thrush at Site 1 and Site 2.   *[2]*

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(g) Scientists have hypothesized that the food quality is better at Site 1 than at Site 2. Evaluate this hypothesis using the data provided.   *[2]*

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(h) Suggest **one** advantage and **one** disadvantage for blood sampling rather than weighing birds to assess food quality at stopover sites.   *[1]*

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2. (a) The scanning electron micrograph below shows the surface of the nuclear envelope with numerous nuclear pores.

0.2 µm
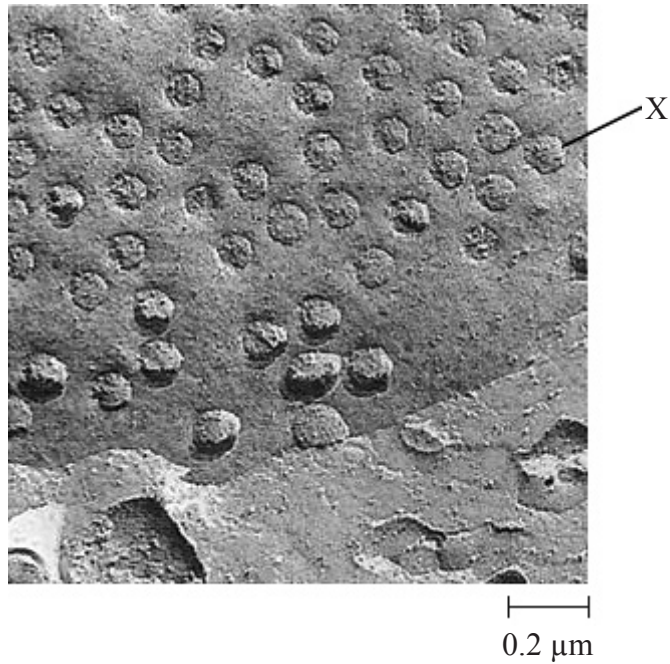
[Source: adapted from D Nelson and M Cox, (2000), *Lehninger Principles of Biochemistry*, third edition, page 35]

(i) Calculate the power of magnification of the image. *[1]*

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(ii) State the diameter of the pore labelled X. *[1]*

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(b) List **two** examples of how human life depends on mitosis. *[1]*

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(Question 2 continued)

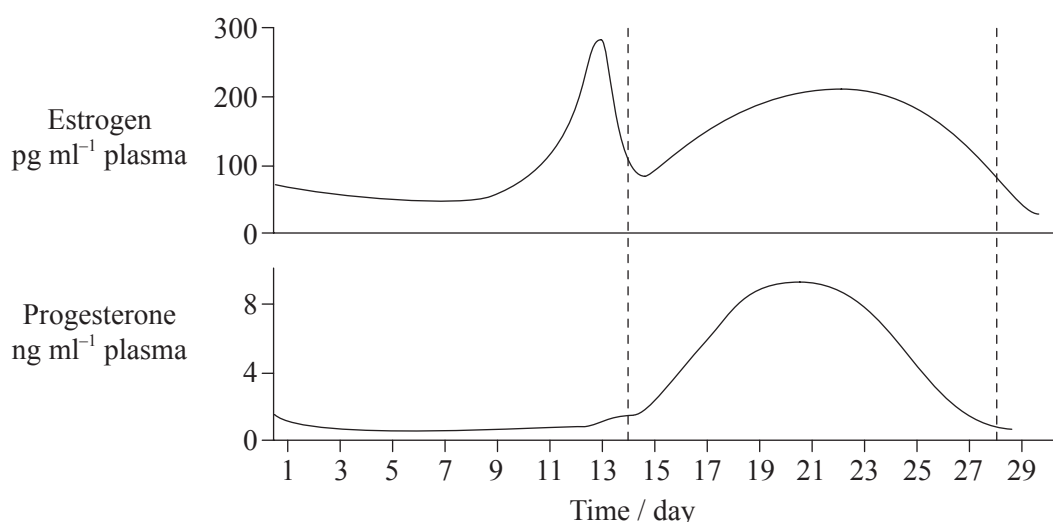(c)   Describe the importance of stem cells in differentiation.   *[3]*

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(d)   The graphs below show the normal menstrual cycle.

[Source: adapted from www.mivf.com.au/ivf/infertility/images/cyclediagram.GIF]

(i)   Predict, with a reason, how the graphs will change if the woman becomes pregnant.   *[2]*

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(ii)   List **two** roles of testosterone in males.   *[1]*

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3.   (a)   Outline the bonding between DNA nucleotides.   [2]

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(b)   Explain how chemical bonding between water molecules makes water a valuable coolant in living organisms.   [2]

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(c)   State a word equation for anaerobic cell respiration in humans.   [1]

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4.   (a)   Explain why carriers of sex-linked (X-linked) genes must be heterozygous.   *[2]*

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(b)   (i)   Label the diagram below which shows a basic gene transfer.   *[2]*
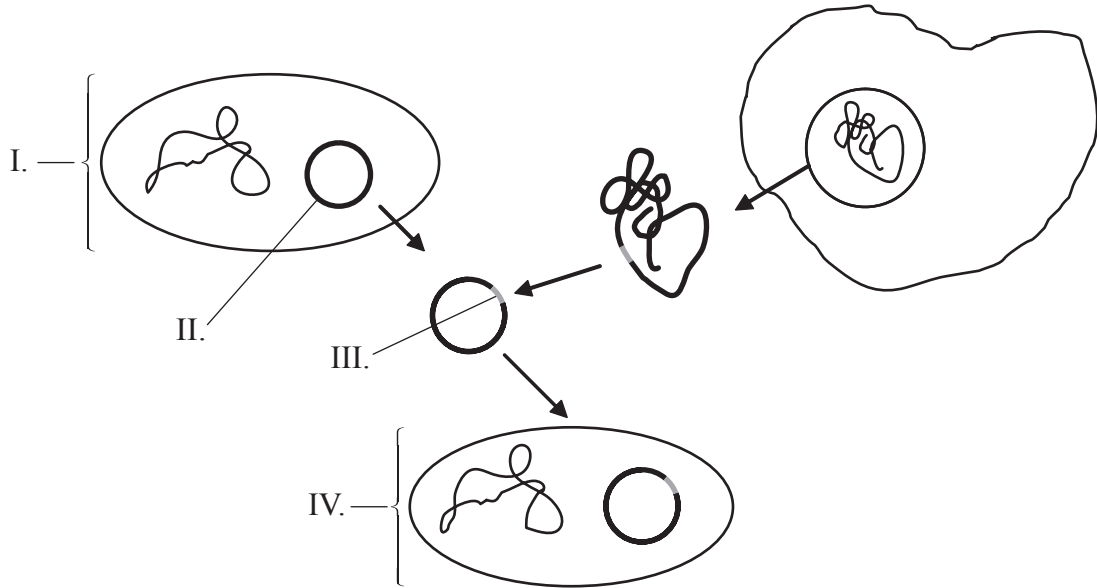
I.   . . . .

II.   . . . .

III.   . . . .

IV.   . . . .

(ii)   State **two** general types of enzymes used in gene transfer.   *[1]*

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SECTION B

*Answer **two** questions. Up to two additional marks are available for the construction of your answers. Write your answers on the answer sheets provided. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.*

5. (a) Outline the structure of a ribosome. *[4]*

(b) Distinguish between fibrous and globular proteins with reference to **one** example of each protein type. *[6]*

(c) Explain the role of auxin in phototropism. *[8]*

6. (a) Outline the process of glycolysis. *[5]*

(b) Describe how pancreatic cells directly affect blood glucose levels. *[5]*

(c) Explain why diabetes could be detected through the analysis of urine. *[8]*

7. (a) Draw a labelled diagram of a mature sperm. *[5]*

(b) Outline the formation of chiasmata during crossing over. *[5]*

(c) Explain how an error in meiosis can lead to Down syndrome. *[8]*

8. (a) Describe the relationship between the rise in the concentration of atmospheric carbon dioxide and the enhanced greenhouse effect. *[5]*

(b) Outline the precautionary principle. *[5]*

(c) Antibiotic resistance in bacteria is an example of evolution in response to environmental change. Using another example, explain how an environmental change can lead to evolution. *[8]*