



22076017

BIOLOGY
STANDARD LEVEL
PAPER 2

Monday 14 May 2007 (afternoon)

1 hour 15 minutes

Candidate session number

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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 one question 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.

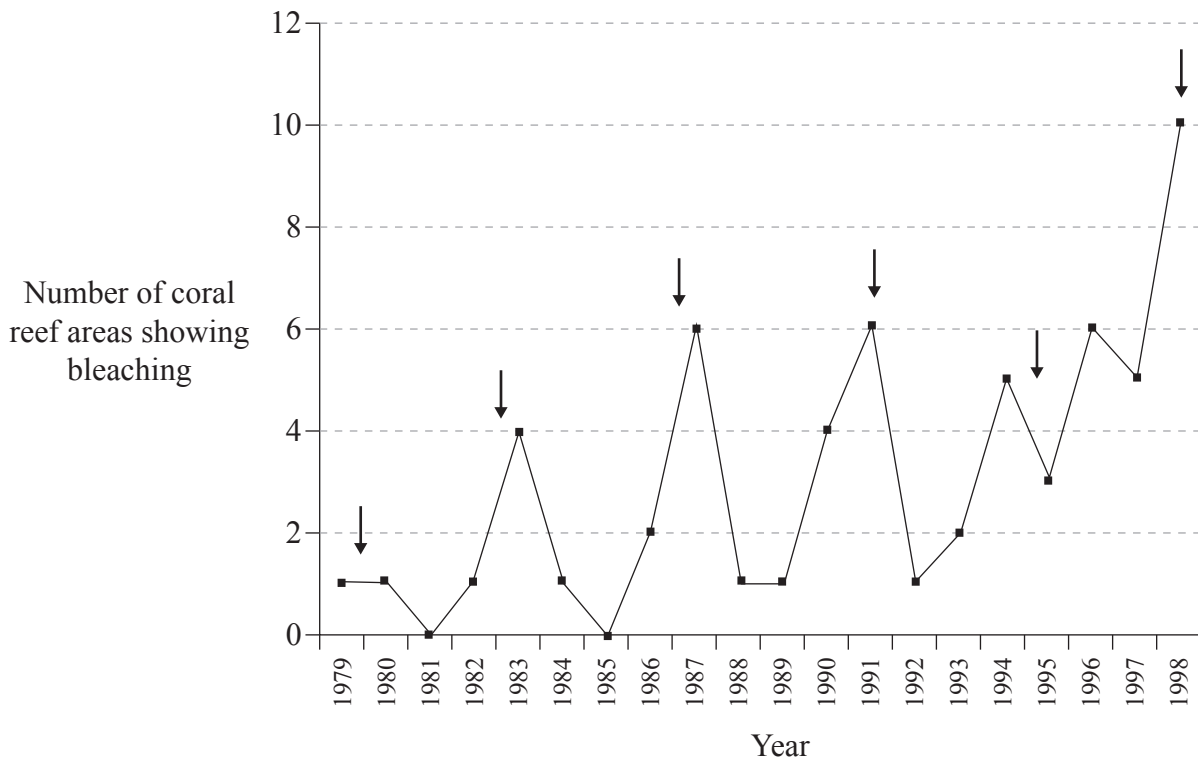


SECTION A

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

- 1. A coral polyp is a marine organism, characterized by a hard skeleton. Coral reefs are colonies of numerous individual polyps. Coral polyps often form close associations with tiny plants such as algae. The algae, which live within the tissues of the polyp, give the coral its unique colour. The algae receive nutrients from their host and provide the host with a food source in return. When coral undergoes environmental stress it expels algae from its polyps and the coral appears white. This process is called “coral bleaching”.

The graph below indicates the number of coral reef areas showing bleaching over a 20-year period off the coast of Australia. The arrows indicate the occurrence of El Niño, an event that brings effects such as an increase in water temperature around the coral.



[Source: adapted from M Spalding, K Teleki, and T Spencer, (1999), *Climate Change and Coral Bleaching*, UNEP World Conservation Monitoring Centre, www.unep-wcmc.org/climate/climate%20report.htm, reprinted with permission of the authors]

- (a) Outline the trend in the number of coral reef areas showing bleaching over the period 1979 to 1998. [2]

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(Question 1 continued)

- (b) Discuss the effect of El Niño on the incidence of coral bleaching. [3]

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- (c) Scientists suggest that El Niño may be increasing in frequency. Suggest the impact that this might have on coral bleaching. [1]

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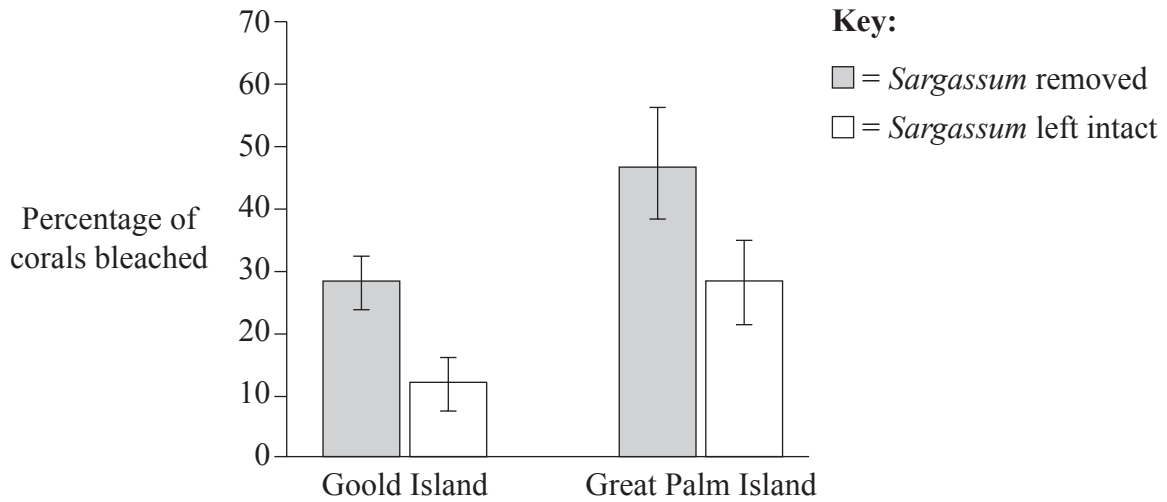
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(Question 1 continued)

Sargassum, a variety of brown algae that exists as a floating canopy above coral, was studied to determine its impact on the rate of coral bleaching. The graph below shows the percentage of bleached corals on two reefs, Goold Island and Great Palm Island, with the *Sargassum* canopy left intact and with the *Sargassum* canopy removed.



[Source: J Jompa and L McCook, (1998), *Seaweeds save the reef?! Sargassum canopy decreases coral bleaching on inshore reefs*, www.aims.gov.au/pages/research/seaweed/seaweed-canopy01.html, reprinted with the permission of the Australian Institute of Marine Science]

(d) Identify the percentage of corals bleached near Great Palm Island when *Sargassum* is left intact. [1]

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(e) Compare the effect of *Sargassum* removal on the amount of coral bleaching at the **two** locations. [2]

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(Question 1 continued)

(f) With reference to the effects of El Niño and *Sargassum* removal, suggest **two** abiotic factors which might contribute to coral bleaching. [2]

1.

2.

(g) Suggest, giving a reason, how **one** human impact might increase the degree of coral bleaching. [2]

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2. (a) List **three** advantages of using a light microscope over using an electron microscope. [2]

1.

2.

3.

(b) Discuss the cell theory in relation to unicellular organisms. [3]

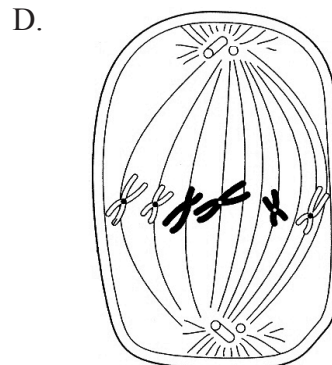
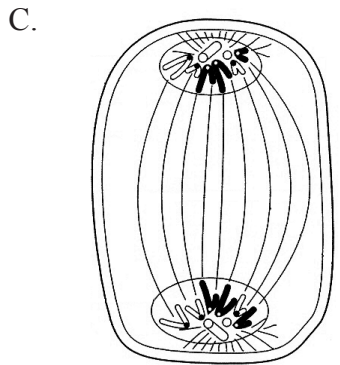
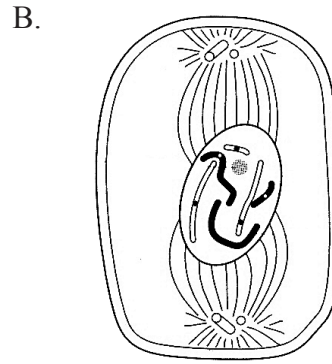
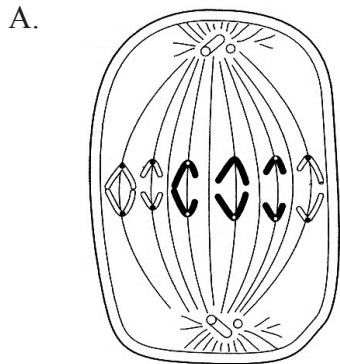
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(Question 2 continued)

(c) Identify the stage of mitosis shown in the following diagrams by completing the table below. [2]



[Source: adapted from J Addis, E Larkcom and R Miller, (1996), *Cell Biology and Genetics*, Nelson advanced Modular Science, Nelson Thornes, page 71, reprinted with the permission of the authors]

Diagram	Stage of mitosis
A	
B	
C	
D	



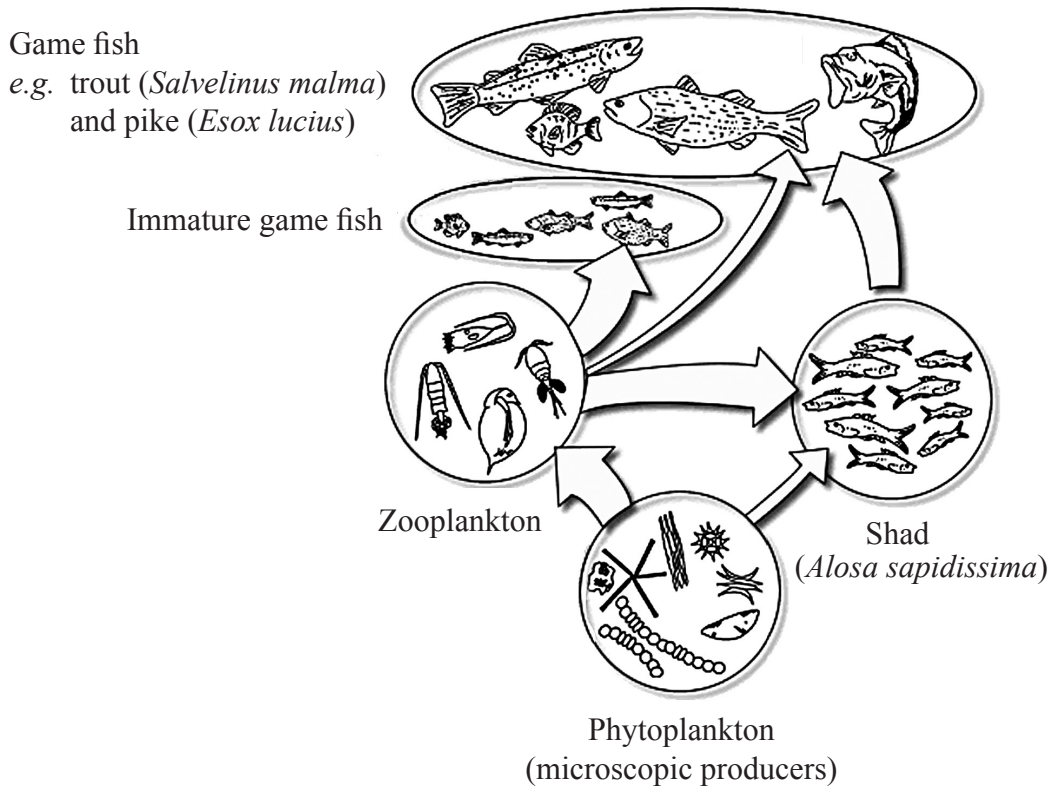
3. (a) Outline why the transparency of water is important to organisms living in an aquatic habitat. [2]

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(b) The diagram below shows a simplified food web for a lake.



[Source: Water on the Web (2004), *Monitoring Minnesota Lakes on the Internet and Training Water Science Technicians for the Future – A National On-line Curriculum using Advanced Technologies and Real-Time Data*, www.waterontheweb.org/under/lakeecology/11_foodweb.html, reprinted with the permission of Water on the Web project, University of Minnesota, Duluth, MN 55812]

(i) State the initial energy source for the above food web. [1]

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(ii) Define the term *trophic level*. [1]

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(Question 3 continued)

(iii) Deduce the trophic level of the immature game fish. [1]

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(iv) In the food web shown, identify **one** heterotroph and **one** autotroph. [1]

heterotroph:

autotroph:

4. (a) State the use of the polymerase chain reaction in biotechnology. [1]

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(b) Explain the use of pectinase in fruit juice production. [2]

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(c) Identify **two** features of chromosomes that are used to create a karyotype. [1]

1.

2.



SECTION B

Answer **one** question. Up to two additional marks are available for the construction of your answer. 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) Draw and label a diagram of the molecular structure of DNA. [6]
- (b) Explain, using sickle cell anemia as an example, the consequences of a base substitution mutation with regard to transcription and translation. [8]
- (c) Compare the structure and composition of DNA with RNA. [4]
6. (a) Outline the role of photosynthesis and cellular respiration in carbon cycling and energy flow in food chains. [8]
- (b) Compare anaerobic cellular respiration and aerobic cellular respiration. [5]
- (c) Explain how the rate of photosynthesis can be measured. [5]
7. (a) Explain the importance of surface area to volume ratio in relation to each of the following: cell size, villus function and alveolus function. [7]
- (b) Draw and label a diagram to show the fluid mosaic model of a biological membrane. [6]
- (c) Describe the control of body temperature in humans. [5]
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