

QUESTION 4 (6 marks)

Meiosis occurs in the gonads of all sexually reproducing organisms and involves two divisions of the parent cell.

- a) Compare and contrast Metaphase I and Metaphase II of meiosis by drawing a cell of each type that would be found in a *Drosophila melanogaster* fly with diploid number $2n = 6$. Show the two unique processes that occur in Prophase I and are still observed in Metaphase I by clearly labelling the paternal and maternal chromosomes. Label a chromosome, a chromatid and an homologous pair where appropriate on both drawings, and any other labels that aid in comparing and contrasting the two stages. [4 marks]

- b) Explain the importance of the two processes that occur in Metaphase I to the survival of the species. [2 marks]

QUESTION 5 (5 marks)

Salmon migrate from freshwater streams to the ocean but then return to these streams to spawn. When migrating from their stream of birth to an estuary and out into the sea, salmon tend to swim in large schools. In a study of salmon population size in a migrating school of salmon, 400 fish were caught and marked with a small snip out of their tail fin. When the fish arrived at the sea, a random sample of 400 were collected by net. In this sample, 50 of the fish were marked.

- a) Use the formula for the Lincoln index, $N = \frac{M \times n}{m}$, to determine the estimated number of salmon in the migrating population at the beginning of the migration. *[2 marks]*

- b) During the migration, the salmon will be exposed to various biotic and abiotic limiting factors that affect survival of the fish.
Explain the meaning of this statement, using at least two examples relevant to salmon to support your explanation. *[3 marks]*

QUESTION 3 (3 marks)

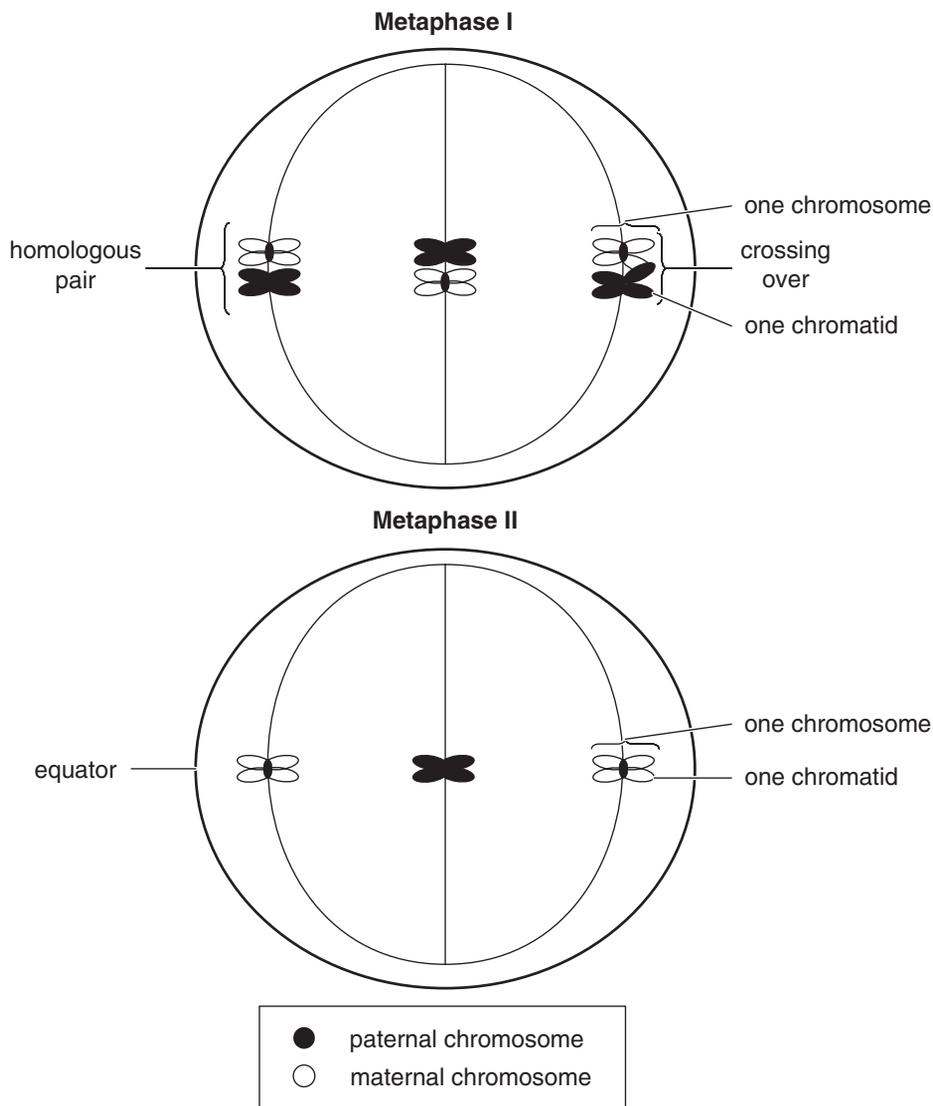
In the food web, acacia seeds and shoots come from producers and provide food, and therefore energy, for the first-order consumers pigeons and parrots. In 2014, the unusually large number of parrots would have eaten much of the available seeds and shoots, especially from the acacias. [1 mark]

Beetles and ants are first-order consumers that provide food for the malleefowl, a second-order consumer. With fewer available acacia seeds and shoots for the malleefowl, they would have eaten more ants and their numbers would have decreased. [1 mark]

The malleefowl would have then started to eat more beetles, causing the observed significant decrease in the beetle numbers. [1 mark]

QUESTION 4 (6 marks)

a)



[4 marks]

Award 1 mark for drawing the two cells.

Award 1 mark for appropriate labels.

Award 1 mark for showing independent assortment.

Award 1 mark for showing crossing over.