Supplemental Material

CBE—Life Sciences Education

Cooke *et al.*

2. Consider a population of diploid animals. As part of your graduate studies, you genotype the animals, and find the following: there are 38 animals that are homozygous for the dominant allele, 25 that are homozygous for the recessive allele, and 137 heterozygotes.

a) What do "p^2, 2pq, q^2" represent in the Hardy-Weinberg theorem? (1 mark)

b) Is the population in Hardy-Weinberg equilibrium? Show ALL your work. (5 marks)

c) Your friend tells you that when populations are not in Hardy-Weinberg equilibrium, natural selection is happening. Do you agree with them? Why or why not? (2 marks).

1. Consider a population of diploid animals. As part of your graduate studies, you genotype the animals, and find the following: there are 85 animals that are homozygous for the dominant allele, 170 that are homozygous for the recessive allele, and 245 heterozygotes.

a) What do "p^2, 2pq, q^2" represent in the Hardy-Weinberg theorem? (1 mark)

b) Is the population in Hardy-Weinberg equilibrium? Show ALL your work. (5 marks)

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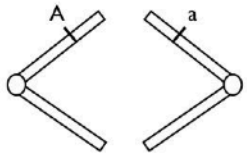
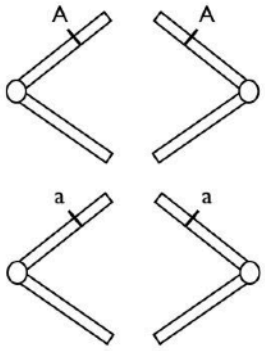
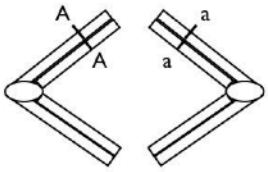
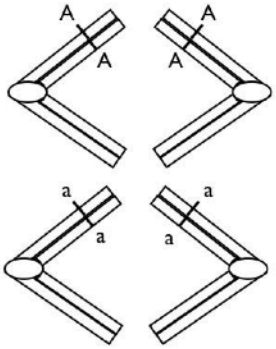
Question 2.

a) Compare and contrast the genetic make-up of daughter cells produced after mitosis to those produced after meiosis. (1 mark)

b) The following diagrams show chromosomes of a heterozygous diploid organism at anaphase. The organism is 2n=2 and has the genotype A/a, where A and a are two alleles of a given gene. Each rectangle containing chromosomes represents one cell. (6 marks)

In the columns labelled "Answer", indicate whether the cell is in anaphase of **mitosis**, **meiosis I**, **meiosis II** or if it represents an **impossible** situation.
For each cell, justify **why** you believe your answer is correct in the answer box.

Cell diagram	Answer	Cell diagram	Answer
			
			

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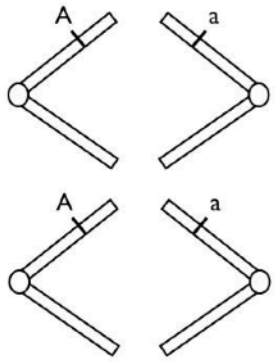		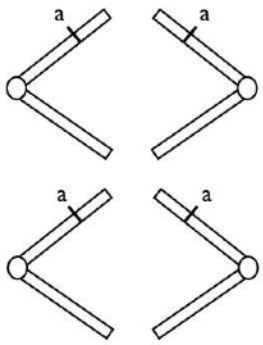	

2. Compare and contrast the genetic make-up of daughter cells produced after mitosis to those produced after meiosis. (1 mark)

b) The following diagrams show chromosomes of a heterozygous diploid organism at anaphase. The organism is 2n=2 and has the genotype R/r, where R and r are two alleles of a given gene. Each rectangle containing chromosomes represents one cell.

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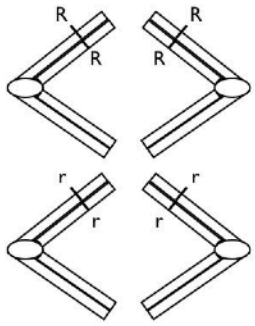		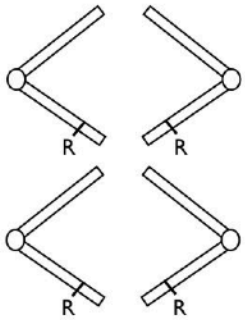	
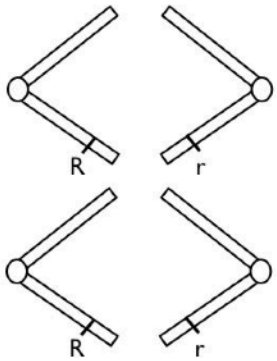		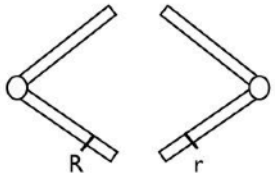	

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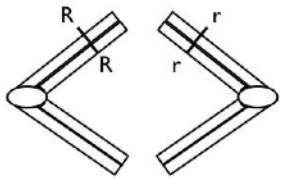		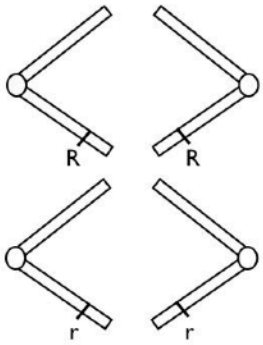	

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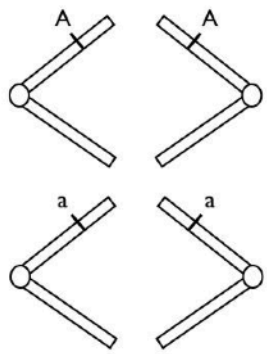		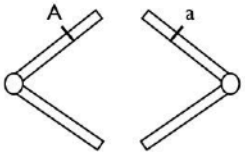	
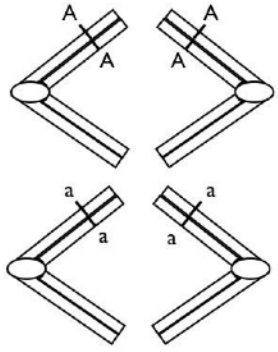		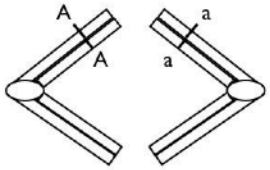	

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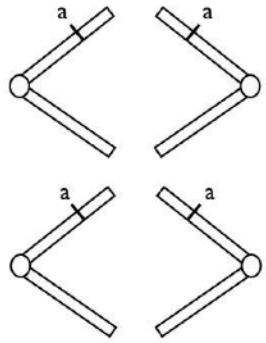
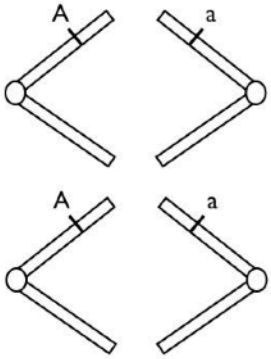
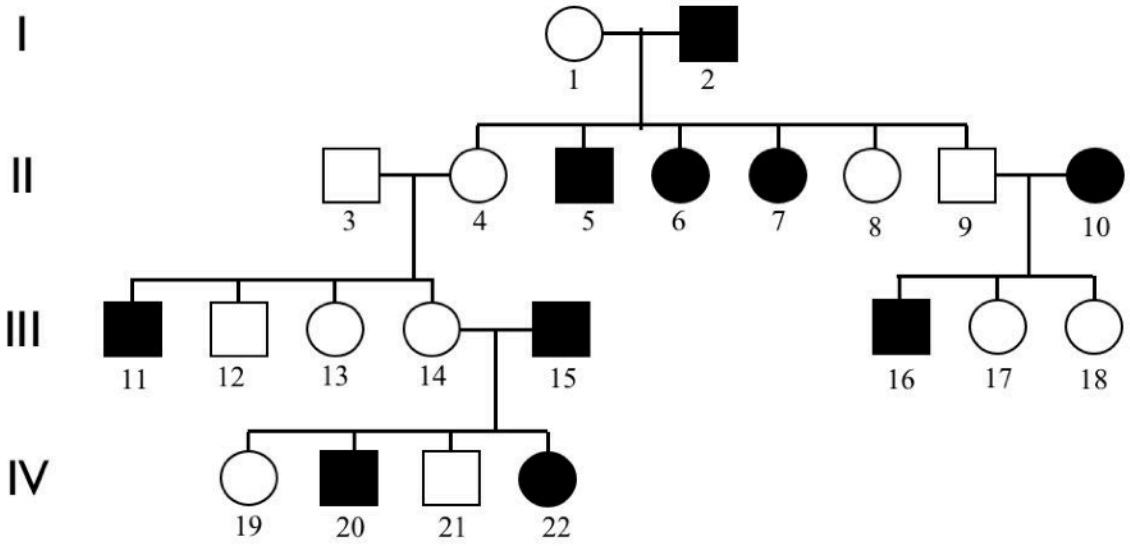
			

Question 1.

a) What can we learn from a pedigree, such as the one below? (1 mark)

b) What is the mode of inheritance indicated in the pedigree below? Assume that any individuals marrying into the family (ie: #3, #10, #15) are **homozygous**. (1 mark)



c) Use specific individuals from the pedigree to explain why the other modes of inheritance are NOT possible. (5 marks)

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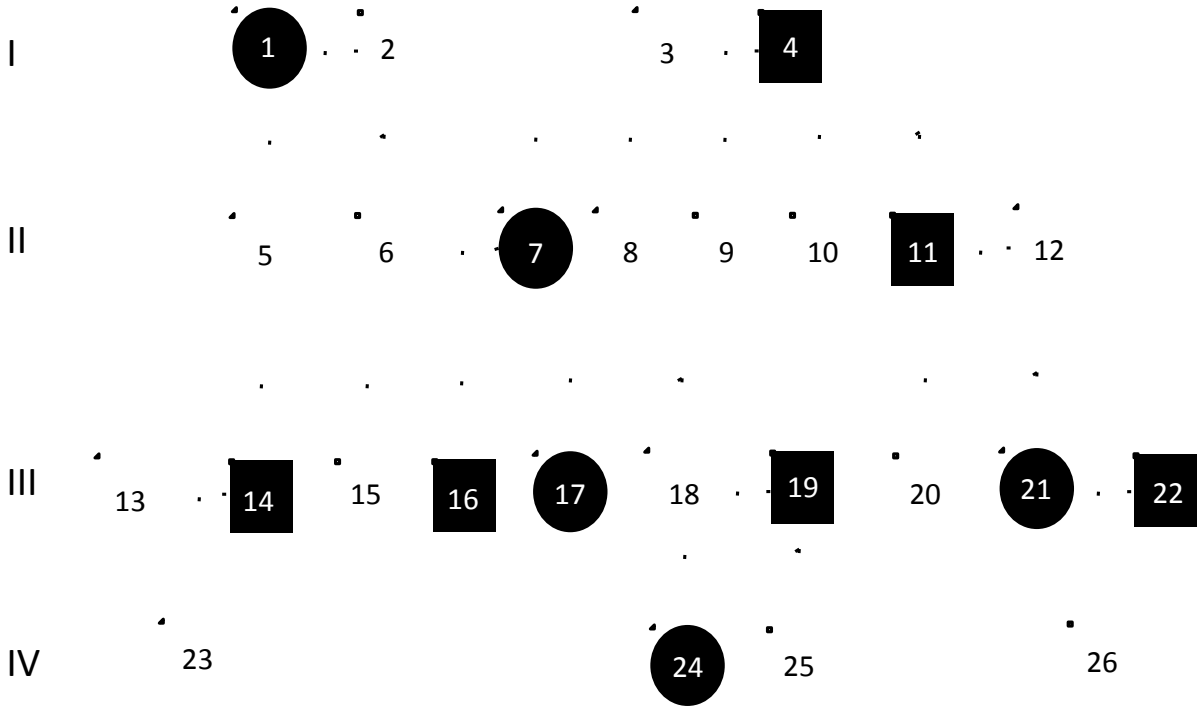

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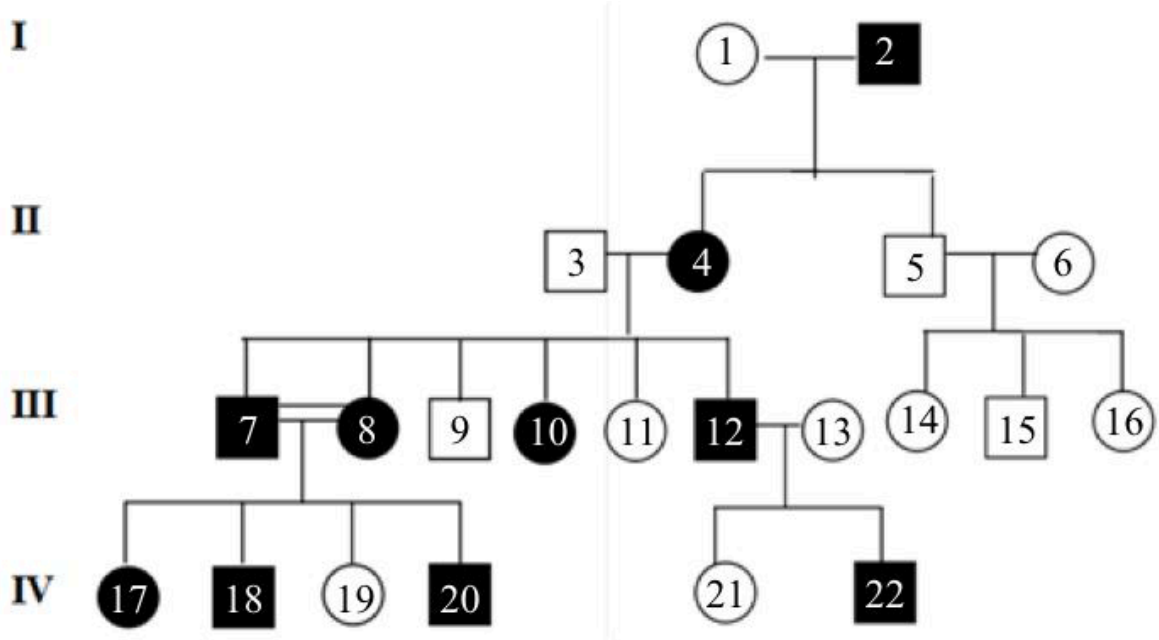

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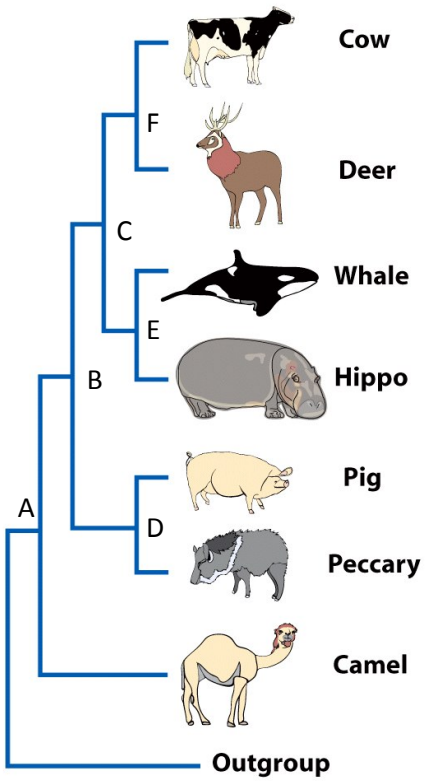
1. Use the phylogenetic tree below to answer questions a) through d).



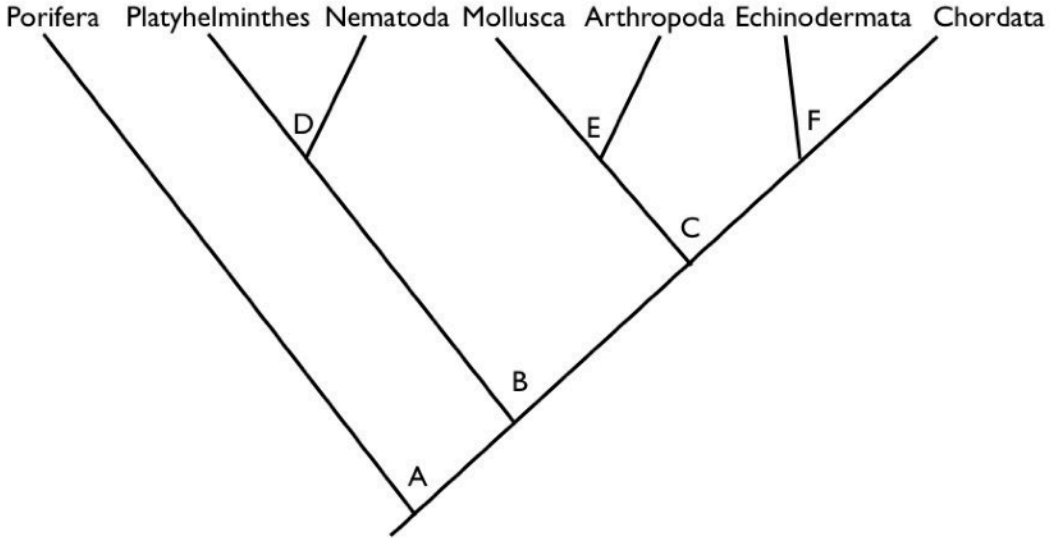
a) Are pigs or whales more closely related to camels? Justify your answer. (2 marks)

b) Are camels ancestral to all other species present in this phylogenetic tree? Why or why not? (3 marks)

c) What does the node labelled 'C' indicate? (1 mark)

d) Are peccaries, pigs, hippos and whales a monophyletic group? Why or why not? (2 marks)

4. Use the phylogenetic tree below to answer questions a) through d).



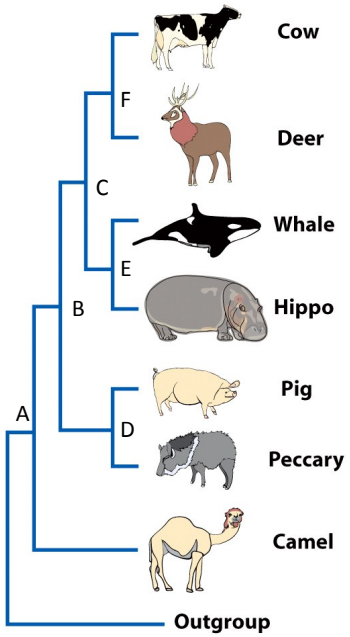
a) Are Nematoda or Arthropoda more closely related to Porifera? Justify your answer. (2 marks)

b) Are Porifera ancestral to all other species present in this phylogenetic tree? Why or why not? (3 marks)

c) What does the node labelled 'C' indicate? (1 mark)

d) Are Platyhelminthes, Nematoda, Mollusca and Arthropoda a monophyletic group? Why or why not? (2 marks)

Use the phylogenetic tree below to answer questions a) through d).



a) Are pigs or whales more closely related to camels? Justify your answer. (2 marks)

b) Are cows ancestral to all other species present in this phylogenetic tree? Why or why not? (3 marks)

c) What does the node labelled 'C' indicate? (1 mark)

d) Are peccaries, pigs, hippos and whales a monophyletic group? Why or why not? (2 marks)