Q1. (a) An order is a taxonomic group. All seals belong to the same order. Name **one** other taxonomic group to which all seals belong.

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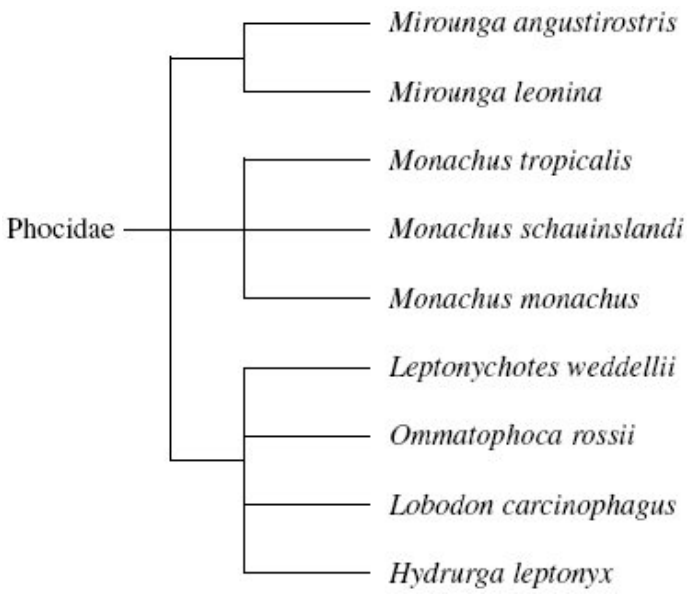
(1)

(b) The diagram shows how some species of seal are classified.



(i) How many different genera are shown in this diagram?

(1)

(ii) All the seals shown in the diagram are members of the Phocidae. Phocidae is an example of a taxonomic group. Of which taxonomic group is it an example?

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(1)

(iii) The diagram is based on the evolutionary history of the seals. What does the information in the diagram suggest about the common ancestors of *Mirounga angustirostris*, *Mirounga leonina* and *Monachus tropicalis*?

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(1)

(c) A species of seal shows genetic diversity. Explain what is meant by genetic diversity.

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(1)

(d) In the late 18th century, the population of northern elephant seals was estimated to be about 150 000. These seals lived in different colonies in different places. The seals were then hunted. By 1910, the total population had fallen to under 100. All these seals lived in a single colony on one island. Hunting then stopped. Numbers increased and there are now approximately 150 000 seals living in many different colonies.

Use this information to explain

(i) what is meant by a genetic bottleneck

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(2)

(ii) how you would expect the founder effect to have influenced the genetic diversity of northern elephant seals after 1910.

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(2)
(Total 9 marks)

Q2. Cranes are large birds. One of the earliest methods of classifying cranes was based on the calls they make during the breeding season.

(a) Explain why biologists could use calls to investigate relationships between different species of crane.

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(2)

(b) More recently, biologists have used DNA hybridisation to confirm the relationships between different species of crane. They made samples of hybrid DNA from the same and from different species. They measured the percentage of hybridisation of each sample. The results are shown in the table.

Species of crane from which hybrid DNA was made			**Percentage DNA hybridisation**
Grus americana	and	*Grus monachus*	97.4
Grus monachus	and	*Grus rubicunda*	95.7
Grus americana	and	*Grus rubicunda*	95.5
Grus rubicunda	and	*Grus rubicunda*	99.9
Grus americana	and	*Grus americana*	99.9
Grus monachus	and	*Grus monachus*	99.8

(i) Which **two** species seem to be the most closely related? Explain your answer.

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(2)

(ii) The biologists measured the temperatures at which the samples of hybrid DNA separated into single strands. Explain why these temperatures could be used to find the percentage of DNA hybridisation.

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(2)

(c) Biologists can also use protein structure to investigate the relationship between different species of crane. Explain why.

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(2)
(Total 8 marks)

Q3. In 2002, biologists identified a new group of insects. They called these insects gladiators.

(a) (i) *Mantophasma zephyra* is one species of gladiator. Complete the table to show how this species is classified.

Kingdom	Animalia
	Arthropoda
	Insecta
	Notoptera
Family	Mantophasmatodae
Species	

(2)

(ii) This system of classification consists of a hierarchy. Explain what is meant by a hierarchy.

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(2)

(b) In 2002, very few gladiators were available for identification. Scientists around the world used photographs to establish the relationship of gladiators to other insects.

Explain how.

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(1)

(Total 5 marks)

Q4. (a) The cheetah, *Acinonyx jubatus*, and other cat species belong to the family Felidae. Complete the table to show the classification of the cheetah.

Kingdom	Animalia
	Chordata
	Mammalia
	Carnivora
Family	Felidae
Genus	

(2)

(b) This system of classification is described as hierarchical. Explain what is meant by a hierarchical classification.

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(1)

(c) Despite differences in form, leopards, tigers and lions are classified as different species of the same genus. Cheetahs, although similar in form to leopards, are classified in a different genus.

(i) Describe **one** way by which different species may be distinguished.

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(1)

(ii) Suggest **two** other sources of evidence which scientists may have used to classify cheetahs and leopards in different genera.

1 .....

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2 .....

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(2)
(Total 6 marks)

Q5. (a) The mammals form a class called the Mammalia within the animal kingdom. The grey wolf is a species of mammal. **Figure 1** shows the groups within the Mammalia to which the wolf (labelled **W**) belongs.

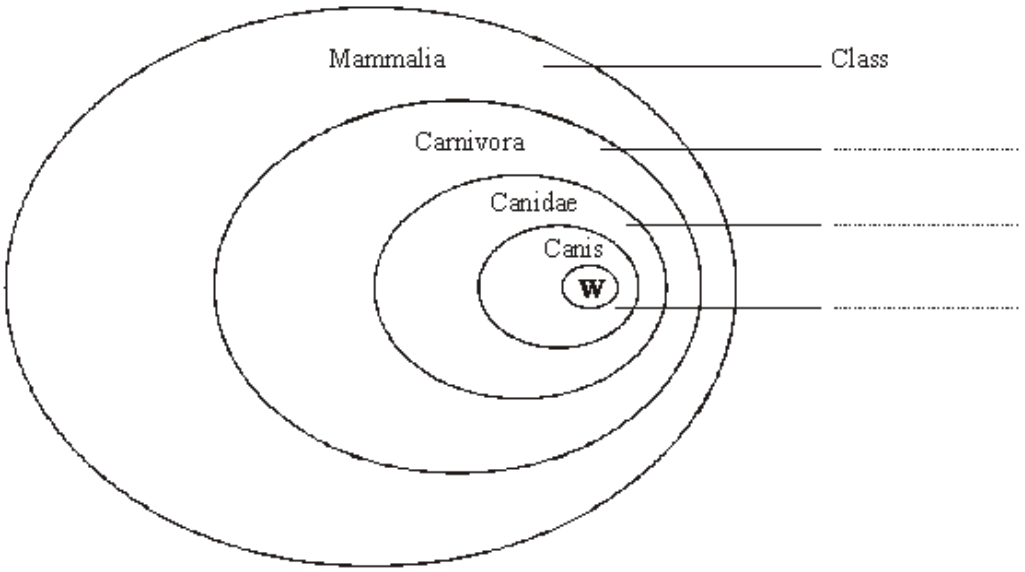

Figure 1

(i) Label **Figure 1** to show the names of the groups.

(2)

(ii) The lion, *Panthera leo*, belongs to another group in the Carnivora, called the Felidae. Add this information to **Figure 1**, using the letter L to represent the lion species.

(1)

(b) The diagrams show two systems of classification of mammals. **Figure 2** shows a simple hierarchy. **Figure 3** shows a phylogenetic system.

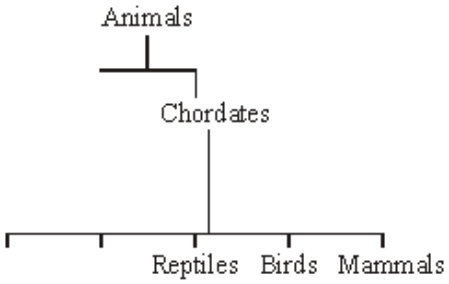

Figure 2

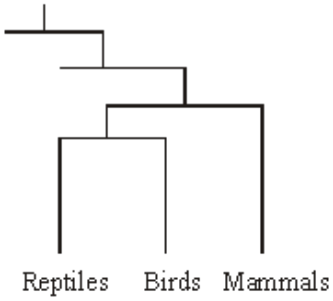

Figure 3

(i) What is meant by a hierarchy?

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(1)

(ii) By reference to **Figures 2** and **3**, explain how a phylogenetic system differs from a simple hierarchy.

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(3)
(Total 7 marks)