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Answer ALL questions in the spaces provided.

1. The lion, *Panthera leo*, is classified as shown in the table below. Complete the table by inserting the appropriate word in each of the spaces provided.

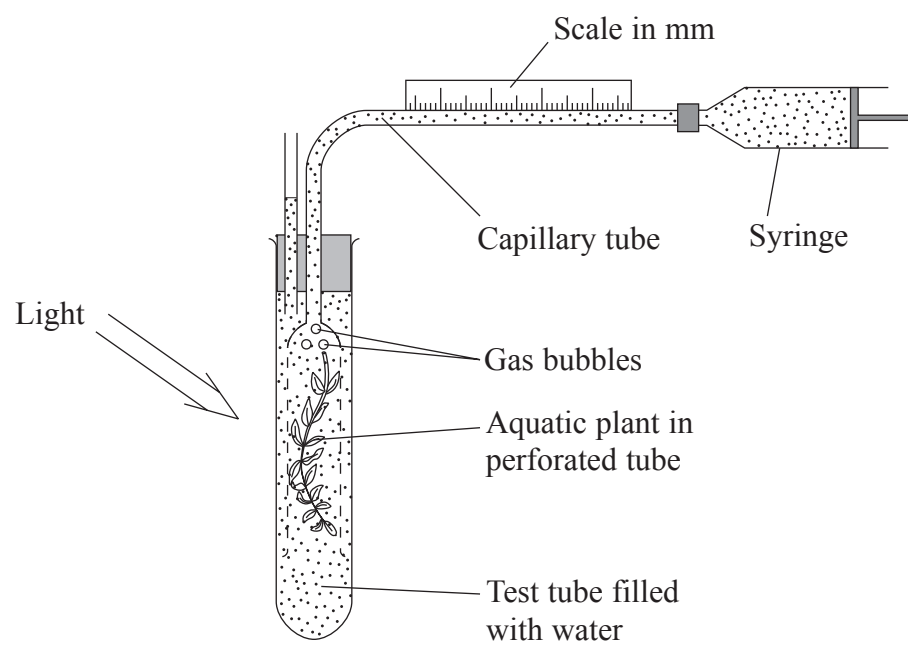
Kingdom	
Phylum	Chordata
	Mammalia
Order	Carnivora
	Felidae
Genus	<i>Panthera</i>
Species	

(Total 4 marks)

Q1



2. An experiment was carried out to investigate the effect of light intensity on the rate of photosynthesis of an aquatic plant, using the apparatus shown below.



(a) Explain what is meant by the term **limiting factor**.

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(2)



3. An investigation was carried out into the effect of grazing by rabbits in an area of grassland. In 1954 and 1957, the mean height of the vegetation was measured.

In 1956 an outbreak of a disease greatly reduced the number of rabbits.

The results are shown in the the table below.

	1954	1957
Mean height of vegetation / cm	2.0	11.5

(a) Describe and explain the effect of the decrease in the number of rabbits on the mean height of the vegetation.

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(2)

(b) A grazed grassland is a plagioclimax community.

(i) Explain what is meant by the term **plagioclimax**.

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(2)



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(ii) Describe how an area of grazed grassland could develop into a woodland community.

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Q3

(Total 8 marks)



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Synoptic Section

The questions in this section are designed to give you the opportunity to make connections between different areas of biology and to use skills and ideas developed throughout the course in new contexts. You should include in your answers any relevant information from the whole of your course.

4. The table below shows the concentrations of four solutes in different regions of a kidney tubule (nephron).

Solute	Concentration of solute / g dm ⁻³			
	Renal (Bowman's) capsule	Proximal convoluted tubule	Distal convoluted tubule	Collecting duct
Urea	0.30	0.55	6.00	15.00
Glucose	0.10	0.00	0.00	0.00
Sodium ions	0.33	0.33	0.10	0.33
Potassium ions	0.17	0.02	0.06	0.85

- (a) (i) Calculate the percentage increase in the concentration of urea between the distal convoluted tubule and the collecting duct. Show your working.

Answer %
(2)

- (ii) Suggest a reason for this change in concentration of urea.

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(1)



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(c) Describe how a prokaryotic cell would differ from the cell shown in (b).

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(3)

Q4

(Total 10 marks)

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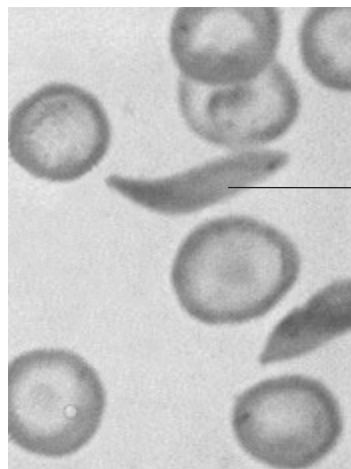
5. (a) Explain what is meant by the term **genetic carrier**.

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(2)

(b) Sickle cell anaemia is caused by the allele of a single gene. People who are homozygous for this allele have sickle cell anaemia and are severely anaemic.

The photograph below shows red blood cells taken from a person with sickle cell anaemia.



(i) Suggest **two** reasons why oxygen transport by cell A may be less efficient than a normal red blood cell.

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(2)



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(ii) A couple have a number of children, only one of whom has sickle cell anaemia. Using a genetic diagram, show how this child inherited sickle cell anaemia. Use the symbols Hb^A to represent the normal allele and Hb^S to represent the sickle cell allele.

(3)

(iii) Give the probability that this couple's next child is a genetic carrier of sickle cell anaemia.

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(1)



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(c) One of the polypeptide chains in the haemoglobin of a person with sickle cell anaemia has a change in one of its amino acids. Explain how a change in DNA can lead to a change in a single amino acid in a polypeptide chain.

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Q5

(Total 12 marks)



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6. Nitrogenase is an enzyme found in some species of bacteria. It is involved in the process of nitrogen fixation. The activity of nitrogenase is dependent on the presence of ATP and certain metal ions.

(a) Name a nitrogen-fixing bacterium.

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(1)

(b) Describe the role of nitrogenase in nitrogen fixation.

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(c) Suggest how the activity of nitrogenase could depend on the presence of ATP and metal ions.

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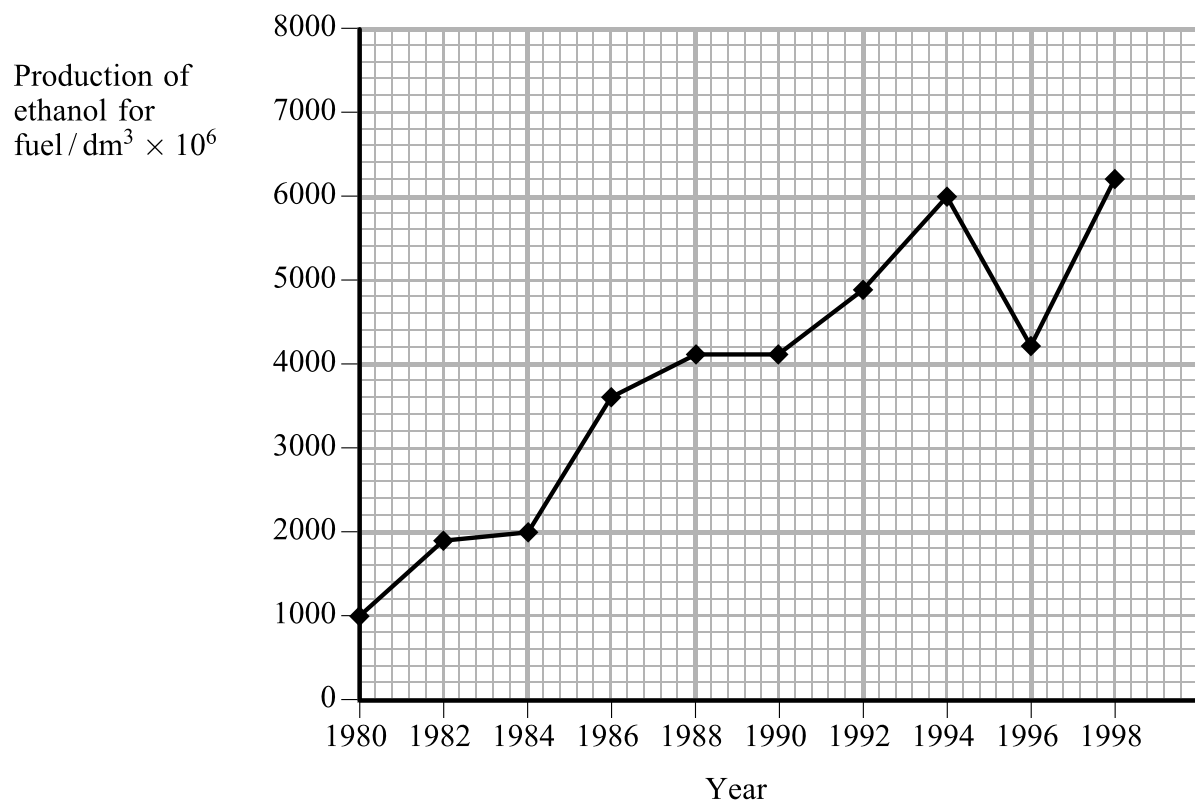
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(4)



7. The graph below shows the changes in the production of ethanol for fuel in the USA from 1980 to 1998.

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(a) Describe the changes in the production of ethanol for fuel in the USA between 1980 and 1998.

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(b) Pure ethanol is not usually used as a fuel. Describe **one** way in which ethanol is used in the production of fuel for motor vehicles.

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(2)



