Plant Structure, Biodiversity and Conservation - Questions by Topic

Q1.

There are 18 species of puffer fish found in the Maldives.

The photograph shows one of these species, *Canthigaster valenti*.

© kaschibo/Shutterstock

Magnification ×0.5

(a) The markings on the skin of *Canthigaster valenti* are warnings to predators. It also protects itself from predators by producing poisons and by inflating its body.

Which row of the table describes these types of adaptations?

(1)

	Markings on the skin	Production of poison	Inflating the body
☐ A	anatomical	behavioural	physiological
☐ B	anatomical	physiological	behavioural
☐ C	physiological	anatomical	behavioural
☐ D	physiological	behavioural	anatomical

(b) Another fish found in the Maldives is *Paraluteres prionurus*.

This fish is not poisonous. It grows to about 10 cm in length.

The photograph shows *Paraluteres prionurus*.

Source: http://www.underwaterkwaj.com/uw-misc/file/Paraluteres-prionurus.htm

Explain how the appearance of *Paraluteres prionurus* shows it is adapted to its habitat.

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(c) Explain why *Canthigaster valenti* and *Paraluteres prionurus* are unable to reproduce with each other.

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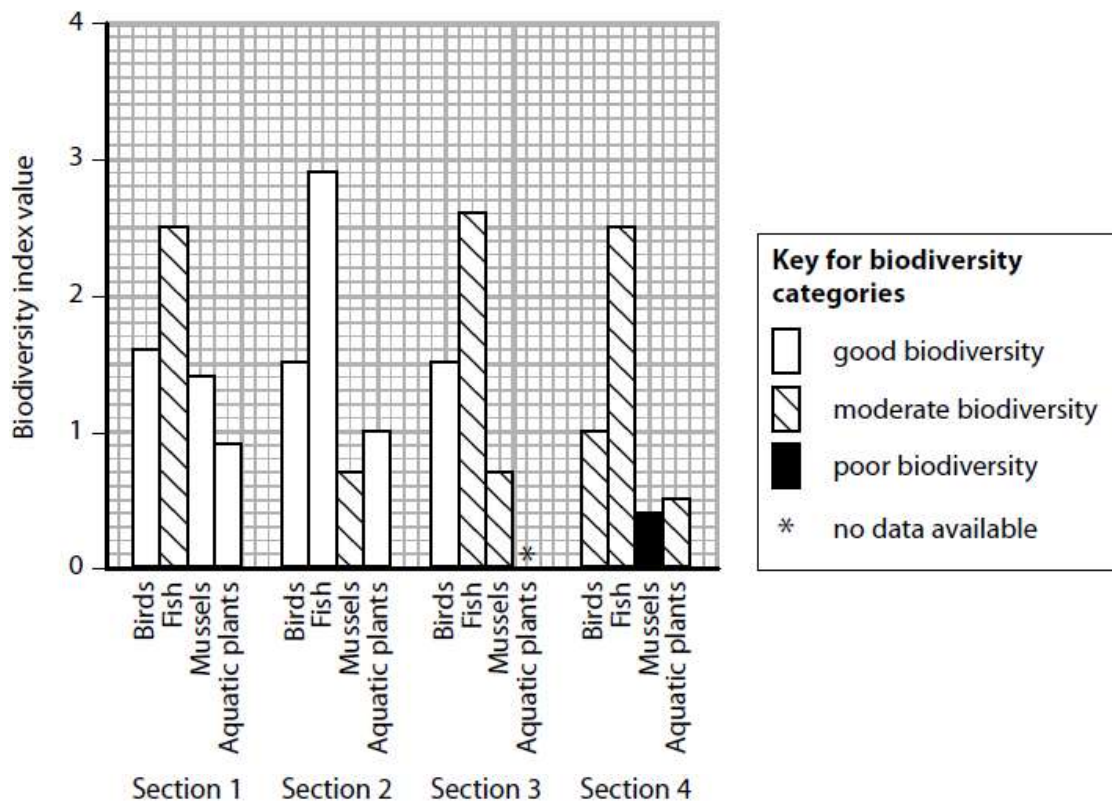
(Total for question = 6 marks)

Q2.

The biodiversity of four groups of organisms – birds, fish, mussels and aquatic plants – was studied along four sections of the Rideau River in Canada.

A biodiversity index value was calculated for each group of organisms.

The graph shows the results of this study.

The biodiversity index value can be used to compare biodiversity within one group of organisms.

The biodiversity categories (good, moderate and poor) can be used to compare biodiversity between different groups of organisms.

(a) Which statement describes biodiversity?

(1)

☐ **A**   species richness of only the endemic species within a habitat

☐ **B**   species richness of all the species within a habitat

☐ **C**   the role of only the endemic species within a habitat

☐ **D**   the role of all the species within a habitat

*(b) Describe the changes in biodiversity along the Rideau River. Use the information in the graph to support your answer.

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(c) In Section 1, birds have a biodiversity index value of 1.6 and fish have a biodiversity index value of 2.5.

Suggest why the fish are considered to have a moderate biodiversity and the birds have a good biodiversity, but the biodiversity index value of the fish is greater.

(2)

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(d) No data were available for aquatic plants in Section 3.

A student collected some data in Section 3 to calculate a biodiversity index value.

The equation that the student used is:

$$D = \frac{N(N-1)}{\Sigma n(n-1)}$$

The data are shown in a table prepared by the student.

Species of aquatic plant	Number of aquatic plants counted	(n – 1)	n(n – 1)
Coontail	8		
Tape grass	6		
Common waterweed	3		
Northern water milfoil	2		
Star duckweed	9		
White water lily	2		
Water stargrass	2		
Eurasian water milfoil	6		
Curly pondweed	5		
European frogbit	2		
Flowering rush	3		

(i) Complete the table.

(1)

(ii) Calculate the biodiversity index value for the aquatic plants in Section 3 of this river.

(3)

Answer ....

(Total for question = 13 marks)

Q3.

The photograph shows a Baird's tapir.

Source: https://www.biolib.cz/IMG/GAL/171566.jpg

(a) Baird's tapir is endemic to countries in Central America.

State what is meant by the term **endemic**.

(1)

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(b) Baird's tapir is classified as endangered.

In 2006, it was estimated that there were 5500 Baird's tapirs. This number had fallen to 3000 in 2016.

(i) Calculate the percentage decrease in the number of Baird's tapirs from 2006 to 2016.

(2)

Answer .... %

(ii) Explain how human activity, other than hunting, could have caused this decrease in the number of Baird's tapirs.

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(c) Preservation of sperm collected from Baird's tapir may help captive breeding programmes.

Scientists investigated the effect of freezing on sperm from Baird's tapir.

The sperm were frozen and then thawed.

The results of this investigation are shown in the table.

Sperm	Percentage of sperm capable of moving (%)	Ability of sperm to swim in a straight line / a.u.	Percentage of sperm with an undamaged acrosome (%)
Freshly collected	63	3.5	80
Frozen and then thawed	38	2.5	48

(i) Describe how each of these effects of freezing could be determined.

(3)

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(ii) Explain how freezing sperm could affect the success of captive breeding programmes.

(4)

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(Total for question = 13 marks)

Q4.

Organisms can be classified into one of three domains.

(a) Organisms belonging to two of these domains have prokaryotic cells.

(i) Bacteria are one of these domains.

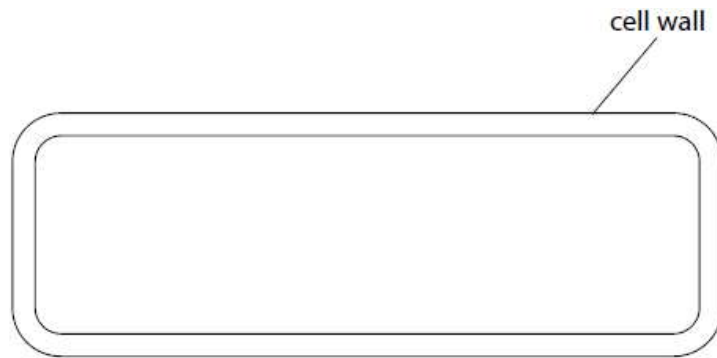Name the other domain that has prokaryotic cells.

(1)

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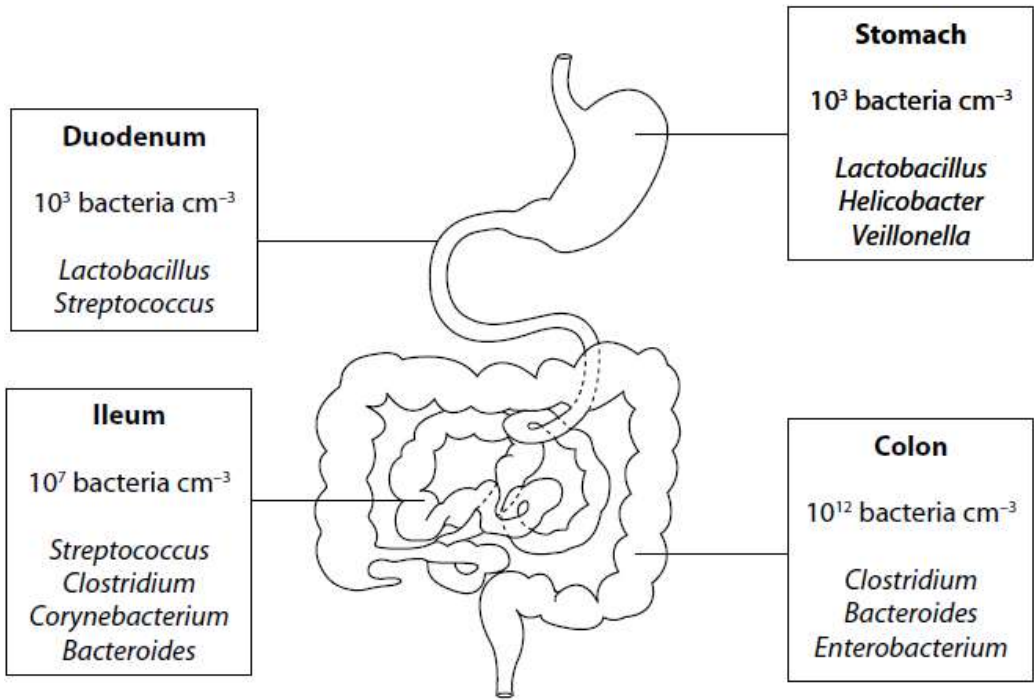(ii) The diagram shows the outline of a bacterial cell.

Draw **three** labelled features on this diagram that may be found in a prokaryotic cell.

(3)

*(b) A variety of different types of bacteria is found in the human digestive system.

The diagram shows part of the human digestive system and the number and types of bacteria that can be found in each organ.

Duodenum

10^3 bacteria cm^{-3}

Lactobacillus
Streptococcus

Stomach

10^3 bacteria cm^{-3}

Lactobacillus
Helicobacter
Veillonella

Ileum

10^7 bacteria cm^{-3}

Streptococcus
Clostridium
Corynebacterium
Bacteroides

Colon

10^{12} bacteria cm^{-3}

Clostridium
Bacteroides
Enterobacterium

The table gives some information about conditions in the digestive system.

Organ	pH	Oxygen content
Stomach	1 to 3	High
Duodenum	6 to 7	
Ileum	6 to 8	
Colon	5 to 7	Low

Explain the distribution of bacteria in the digestive system. Use the information in the diagram and table to support your answer.

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(Total for question = 10 marks)

Q5.

The photograph shows a pumpkin.
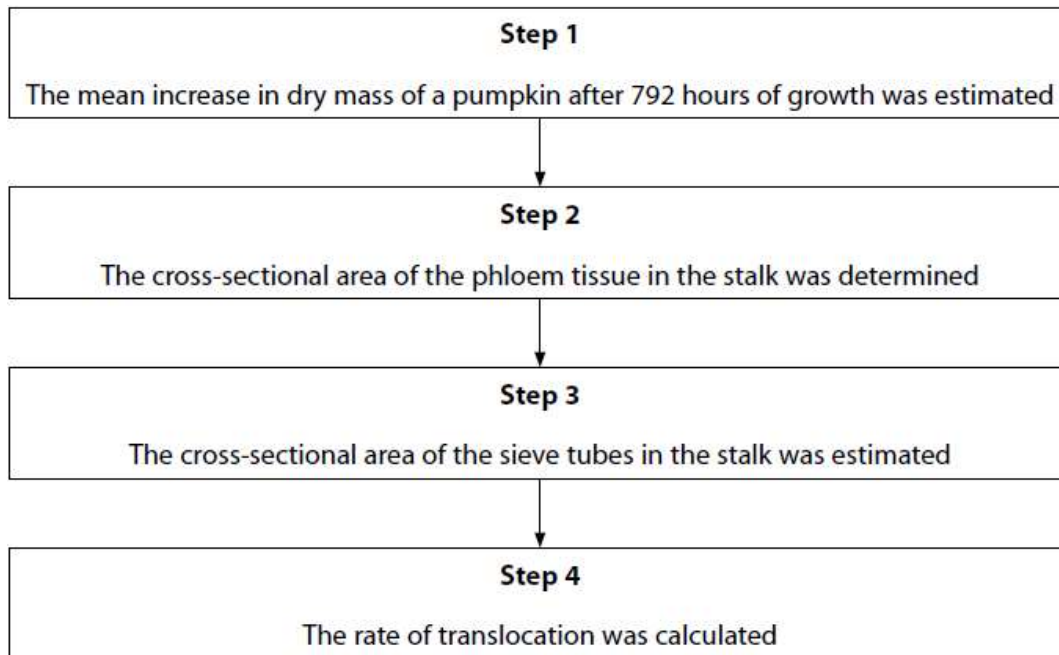

Source from: https://www.aliexpress.com/price/winter-outdoor-plants_price.html

The scientists Crafts and Lorenz investigated the rate of translocation through the phloem in pumpkins.

The flow chart shows the method used in this investigation.

Step 1

The mean increase in dry mass of a pumpkin after 792 hours of growth was estimated

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Step 2

The cross-sectional area of the phloem tissue in the stalk was determined

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Step 3

The cross-sectional area of the sieve tubes in the stalk was estimated

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Step 4

The rate of translocation was calculated

(a) (i) Suggest how the mean increase in dry mass of a pumpkin could be estimated in **Step 1**.

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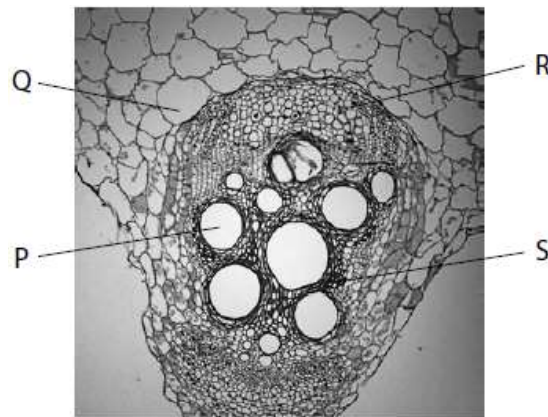..

(ii) Explain why Crafts and Lorenz used dry mass in this investigation.

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(b) (i) The photograph shows a cross-section through part of a stalk, as seen using a light microscope.

Which letter is pointing to the phloem?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(ii) Describe a method that could be used to determine the cross-sectional area of the phloem in **Step 2**.

(2)

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(c) Give a reason why only the cross-sectional area of the sieve tubes, rather than the phloem tissue, was estimated in **Step 3**.

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(1)

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(d) What are the units for the rate of translocation calculated in **Step 4**?

(1)

☒ **A** $g\ cm^{-2}\ hr^{-1}$

☒ **B** $g\ cm^{2}\ hr^{-1}$

☒ **C** $g\ cm^{-3}\ hr^{-1}$

☒ **D** $g\ cm^{3}\ hr^{-1}$

(Total for question = 10 marks)