GCE AS Level Biology

S21-B400U20-1

Assessment Resource 9

Biodiversity and Physiology of Body Systems Resource C

1. The mammalian circulatory system is comprised of the pulmonary and systemic circulations. The table below shows the maximum and minimum blood pressure in different parts of the circulatory system of a mammal.

Part of the circulatory system	Blood pressure / kPa	
	Maximum	Minimum
Left ventricle	16.00	0.00
Right ventricle	3.33	0.00
Aorta	16.00	10.67
Pulmonary artery	3.33	1.07
Muscle capillary	2.00	1.60
Lung capillary	1.08	0.67
Pulmonary vein	0.67	0.27
Vein in forelimb	0.67	0.67
Artery in forelimb	12.57	8.62

(a) (i) Calculate the mean pressure in the lung capillary. [1]

Mean pressure = ... kPa

(ii) The mean pressure in the muscle capillary is 1.80 kPa. Explain the cause of the difference between this and the mean pressure in the lung capillary. [1]

.....

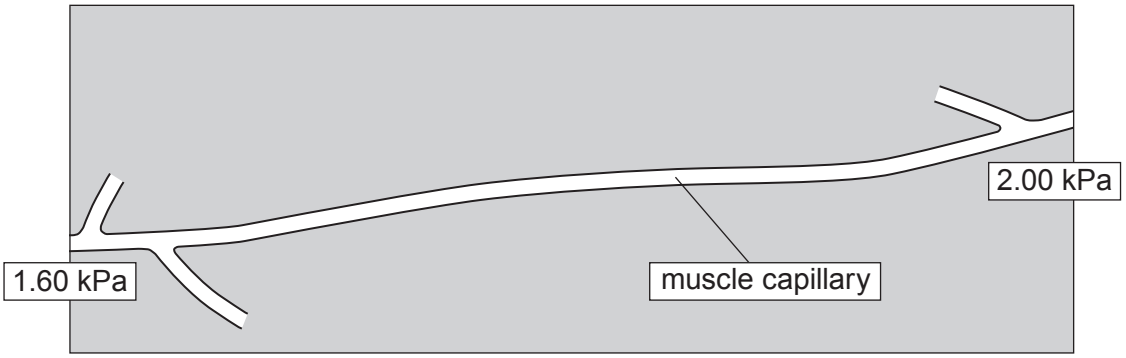
.....

(iii) Suggest and explain **one** advantage for the lower mean pressure in the lung capillary. [2]

.....

.....

(b) The diagram below shows a muscle capillary transporting blood through a tissue. It also shows where the maximum and minimum pressures occur.



(i) **Draw an arrow** on the diagram to indicate the direction of blood flow. [1]

(ii) Account for the difference between the maximum and minimum pressures in the muscle capillary. [3]

.....

.....

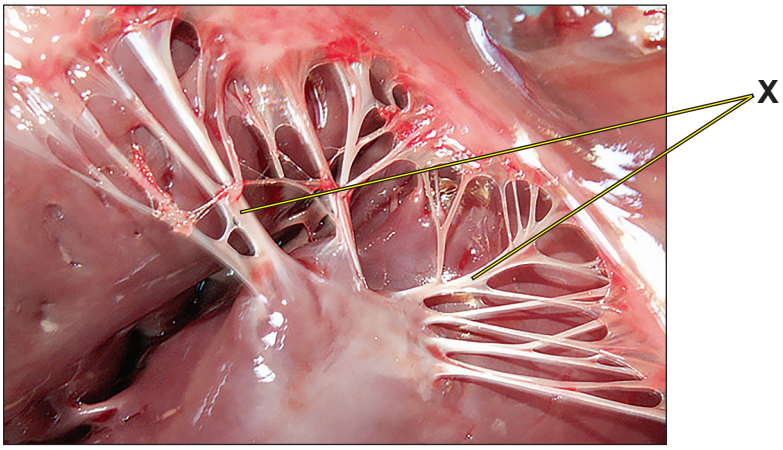
.....

.....

.....

.....

(c) The photograph below shows the detail of the interior of the ventricle of a dissected mammalian heart.



(i) Name the structures labelled **X** in the diagram which are attached to the bicuspid valve. [1]

.....

(ii) Explain the function of the structures labelled **X**. [2]

.....

.....

.....

.....

(d) State **one** ethical issue which should be considered when using animals for dissection. [1]

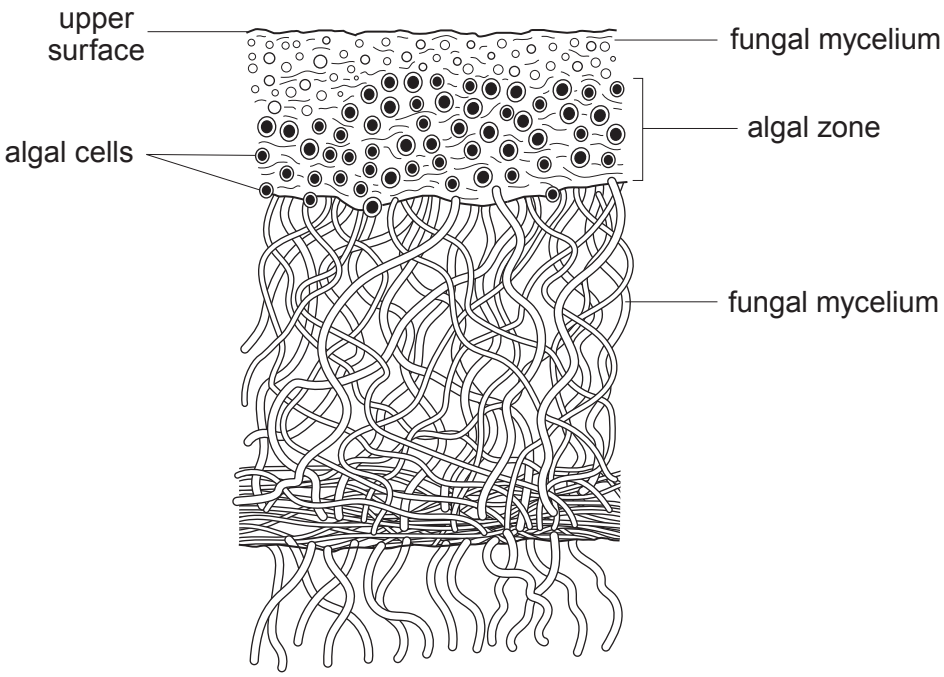
.....

.....

.....

.....

2. Lichens are found growing on many surfaces such as buildings, rocks and tree trunks. They are composed of two organisms, a fungus and a single-celled, photosynthetic alga. The two organisms co-exist in a relationship where both benefit. The main part of the lichen is known as a thallus. The diagram below shows a cross section through a lichen thallus.



(a) Fungi are classed as saprotrophs. Define the term *saprotroph*. [2]

.....

.....

.....

(b) Name **one** inorganic ion the algae would require for growth and explain why it cannot grow without this inorganic ion. [2]

.....

.....

.....

.....

(c) Explain the position and distribution of the algae within the lichen thallus. [2]

.....

.....

.....

.....

(d) Evidence shows that the fungus is able to absorb and transport inorganic ions dissolved in rainwater which the algae then use for growth.

With reference to the modes of nutrition of the two organisms within the lichen suggest the benefit of the association with the algae to the fungus. [2]

.....

.....

.....

.....

(e) A scientist extracted samples of DNA from the algae in lichen from two different locations with similar environmental conditions. Describe how the DNA samples could be used to determine whether the algae within the two lichens were the same species or not. [2]

.....

.....

.....

.....

.....

.....

3. An investigation was carried out to determine the effect of sheep grazing on the plant biodiversity of an upland heath. An area of previously grazed land was fenced off to exclude the sheep and the plant biodiversity was immediately calculated and then recalculated after 5 years. Each calculation of plant biodiversity involved taking a large number of random samples at the site.

(a) (i) Define the term *biodiversity*. [1]

.....

.....

.....

(ii) Describe a suitable method which could be used to collect the data needed to estimate plant biodiversity in this investigation. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(iii) Explain the importance of taking a **large number** of **random** samples. [2]

.....

.....

.....

.....

(iv) Suggest a suitable control for this investigation. [2]

.....

.....

.....

.....

The table below shows the results of the investigation.

Species	Number of individuals	
	Immediately after fencing	Five years after fencing
Erica cinerea (height: 20 cm – 60 cm)	34	18
Calluna vulgaris (height: 20 cm – 60 cm)	26	10
Carex binervis (height: 15 cm – 120 cm)	24	53
Galium saxatile (height: 5 cm – 20 cm)	43	0
Potentilla erecta (height: 10 cm – 30 cm)	53	12
Sorbus aucuparia (height: up to 10 m)	0	2
Diversity (Simpson's index)	0.79	

(b) (i) Use the formula given below to calculate the Diversity index for the experimental site after grazing was excluded for 5 years. **Give your answer to 2 decimal places.** [3]

$$\text{Diversity} = 1 - \frac{\sum n(n-1)}{N(N-1)}$$

N = total number of individual plants
n = number of individuals per species
$\sum$ = sum of

Species	n	$(n-1)$	$n(n-1)$
Erica cinerea			
Calluna vulgaris			
Carex binervis			
Galium saxatile			
Potentilla erecta			
Sorbus aucuparia			
	N =		$\sum n(n-1)$ =
	$(N-1)$ =		

$N(N-1)$ = ...

Diversity index = ...

(ii) State the conclusion you can make about the effect of excluding grazing on the biodiversity of the site. [1]

.....

.....

.....

(c) After grazing had been excluded for 5 years the percentage ground cover by *Erica cinerea* had increased from 33 % to 67 %.

Use this information and the information given in the table on page 12 to suggest how this change could have affected the overall biodiversity at the site. [3]

.....

.....

.....

.....

.....

.....