

# Manipulation of Measure

## Question Paper 2

Level	Pre U
Subject	Biology
Exam Board	Cambridge International Examinations
Topic	Manipulation of Measure
Booklet	Question Paper 2

**Time Allowed:** 42 minutes

**Score:** /35

**Percentage:** /100

- 1 You should read through the whole of this question carefully and then plan your use of the time to make sure that you finish all the work that you would like to do.

Fish gills are composed of gill filaments (primary lamellae). These support large numbers of secondary lamellae that form the gas exchange surface.

- (a) Specimen **K1** is a gill from a mackerel, *Scomber scombrus*.

Use the instruments and hand lens provided to help you examine the structure of the gills.

Make a drawing of specimen **K1** in the space below.

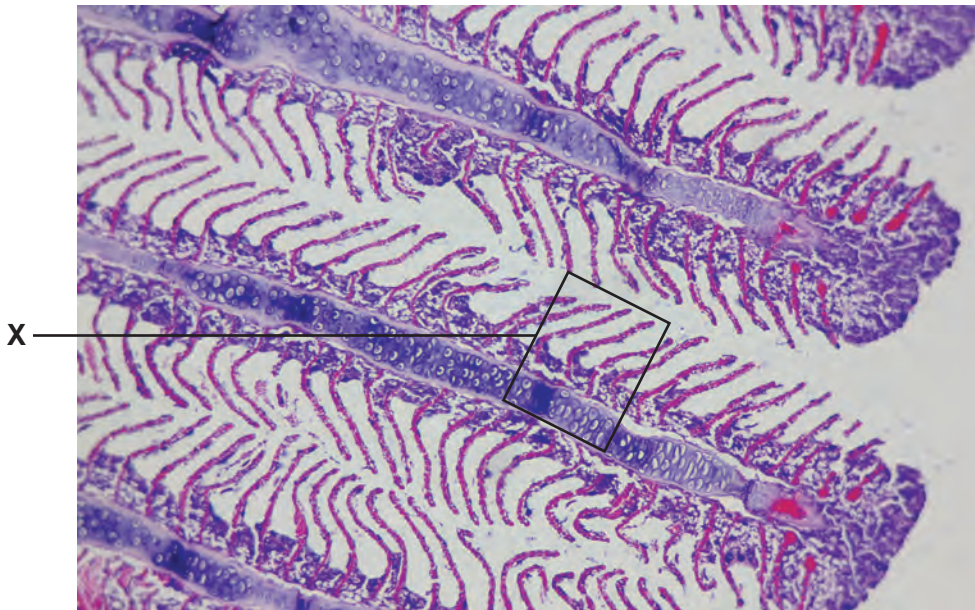
Annotate your drawing to describe the appearance of the gill.

Indicate the magnification of your drawing.

magnification = .....

Slide **K2** is a section of a gill from another species of fish.

Fig. 2.1 shows part of this gill.



**Fig. 2.1**

- (b) Use the high power of your microscope to make a drawing of the gill from slide **K2**, in an area similar to that indicated by **X** on Fig. 2.1.

Indicate the magnification of your drawing and explain how you calculated it.

magnification = .....

explanation

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..... [8]

- (c) Suggest how the surface area of **one** secondary lamella could be determined.

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..... [3]

- (d) A detailed study was carried out on the gas exchange surfaces of individuals of *S. scombrus* and two other species of sea fish.

The results are shown in Table 2.1.

**Table 2.1**

species	body mass /g	mean surface area of a secondary lamella /mm <sup>2</sup>	surface area of secondary lamellae per gram body mass /mm <sup>2</sup> g <sup>-1</sup>
<i>Scomber scombrus</i> (mackerel)	226	0.41	1040
<i>Merlangius merlangus</i> (whiting)	51	0.15	426
<i>Lophius piscatorius</i> (monkfish)	1550	0.50	143

- (i) Suggest why the researchers calculated the surface area of the gas exchange surface as surface area per gram body mass.

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 ..... [1]

- (ii) The three species of fish have different surface areas of secondary lamellae per gram body mass. Suggest how these differences relate to the habitat and activity of the fish.

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 ..... [3]

Slide **K3** is a section of a lung from a small mammal.

Use the high power of your microscope to examine the lung tissue carefully.

**(e)** Lung tissue consists of airways, blood vessels and alveoli.

Compare the features of these three structures that are visible in slide **K3**.

Present your comparison as a table in the space below.

[7]

**(f)** Use the space below to compare gas exchange in mackerel with that in a small mammal.

[6]

**[Total: 35]**