UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

4487941387

BIOLOGY **9700/33**

Advanced Practical Skills 1 **October/November 2011**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black ink.
You may use a pencil for any diagrams, graphs or rough working.
Do **not** use red ink, staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1	
2	
Total	

This document consists of **14** printed pages and **2** blank pages.

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You are reminded that you have **only one hour** for each question in the practical examination.

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You should:

- Read carefully through **the whole** of Question 1 and Question 2.
- Plan your use of **the time** to make sure that you finish all the work that you would like to do.

You will **gain marks** for recording your results according to the instructions.

1 Protein concentration may vary in samples of milk and can be measured by using potassium hydroxide solution and copper sulfate solution.

Fig. 1.1 shows the result of adding potassium hydroxide solution and copper sulfate solution to a sample of milk.

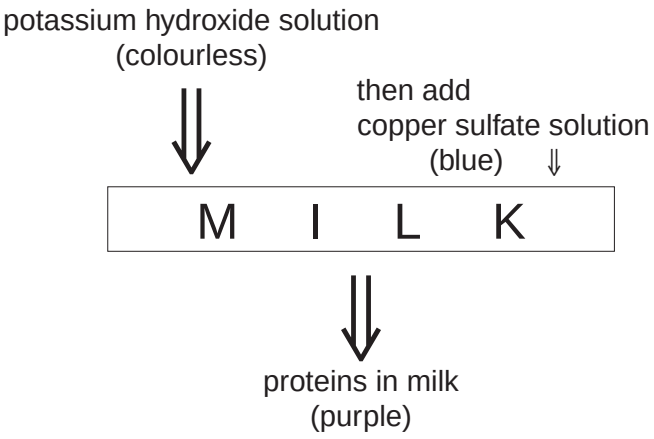


Fig. 1.1

You are provided with:

labelled	contents	hazard	percentage concentration	volume / cm^3
K	potassium hydroxide solution	harmful irritant corrosive	–	20
C	copper sulfate solution	harmful	–	20
M	milk for serial dilution	none	50	20
U	milk sample	none	unknown	10
W	distilled water	none	–	120

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You are advised to wear safety glasses or goggles, especially when using the potassium hydroxide, **K**. If potassium hydroxide, **K**, comes into contact with your skin then wash off with plenty of cold water.

You are required to estimate the protein concentration of a sample, **U**.

You are required to carry out a serial dilution of milk, **M**, to reduce the concentration of the milk by ten-fold between each successive dilution.

Fig. 1.2 shows how to make the first concentration of 5% of milk, **M**.

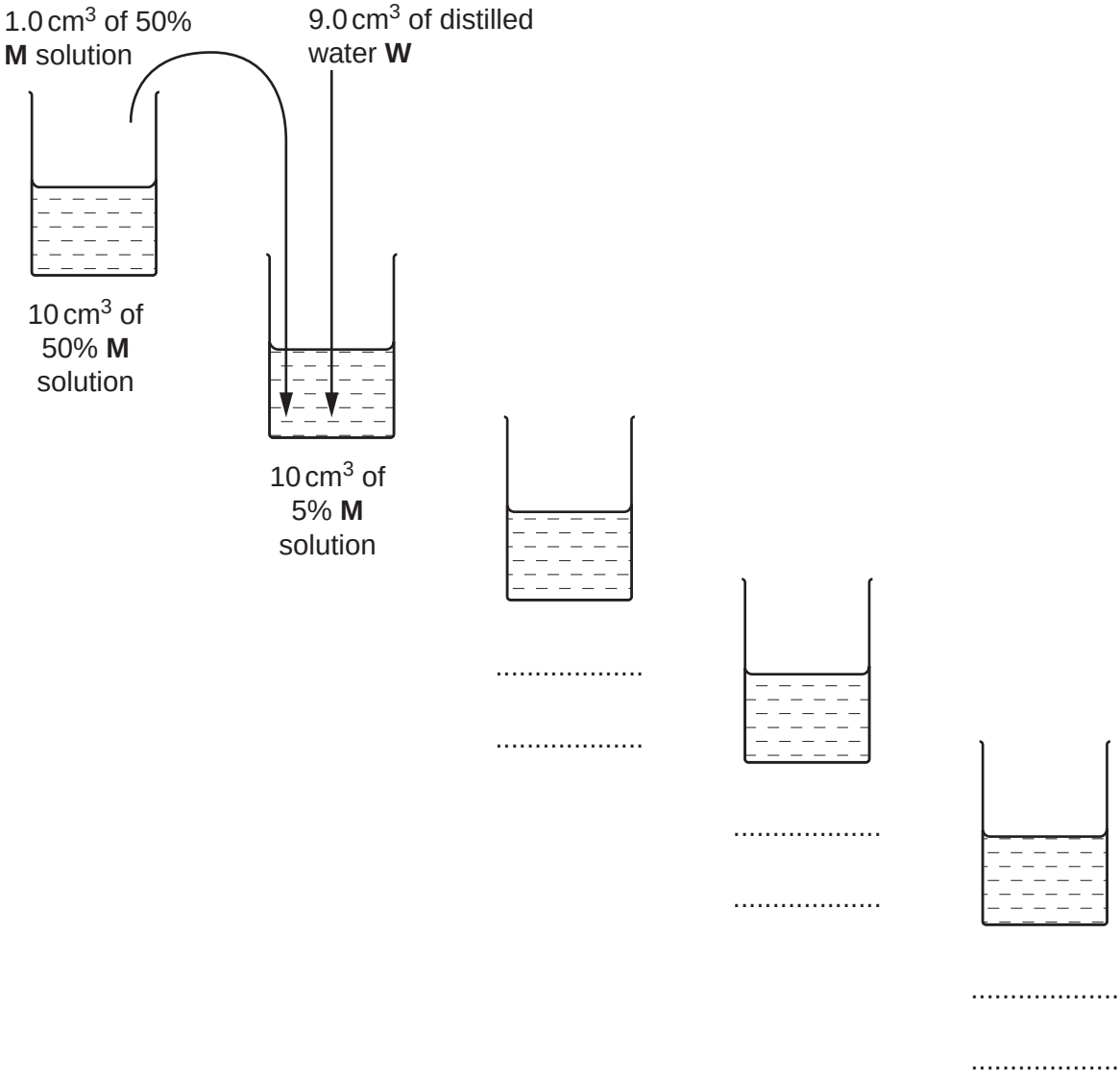


Fig. 1.2

(a) (i) Complete Fig. 1.2 to show how you will make **three** further concentrations of milk, **M**. [3]

A separate syringe must be used for the 50% sample of milk because it is so thick.

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A second syringe must be used for the other concentrations.

Proceed as follows:

1. Prepare the concentrations of milk as shown in Fig. 1.2, in the containers provided.
2. Label five test-tubes with the five concentrations of milk.
3. Put 1 cm^3 of each concentration into the labelled test-tubes.
4. Put 1 cm^3 of **U** into a test-tube, labelled **U**.
5. Put 1 cm^3 of **W** into a test-tube, labelled **W**.
6. Put 1 cm^3 of **K** into each test-tube. Shake gently to mix.
7. Put 1 cm^3 of **C** into each test-tube. Shake gently to mix.
8. Record your observations.
9. In the test-tube rack put the test-tubes in an order which will enable you to record each colour as a number using the scale below.

0 1 2 3 4 5 6 7 8 9 10

blue (no purple) — darkest purple

(ii) Prepare the space below and record your observations and the number using the scale opposite.

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[5]

(iii) Complete the diagram below to show the position of each of the concentrations of **M**.
Write the letter **U** to show where it fits in the series of concentrations.



The protein concentration of the 50% milk, **M** was 18 g 100 cm^{-3}.

Complete the following statement.

The protein concentration of the unknown milk sample, **U**, is between ..... g 100 cm^{-3} and ..... g 100 cm^{-3}. [2]

(iv) Suggest how you would modify this investigation to obtain a more accurate estimate of the protein concentration in milk sample **U**.

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.....[3]

Fig. 1.3 shows the apparatus used by a student to investigate the action of a protein digesting enzyme (protease).

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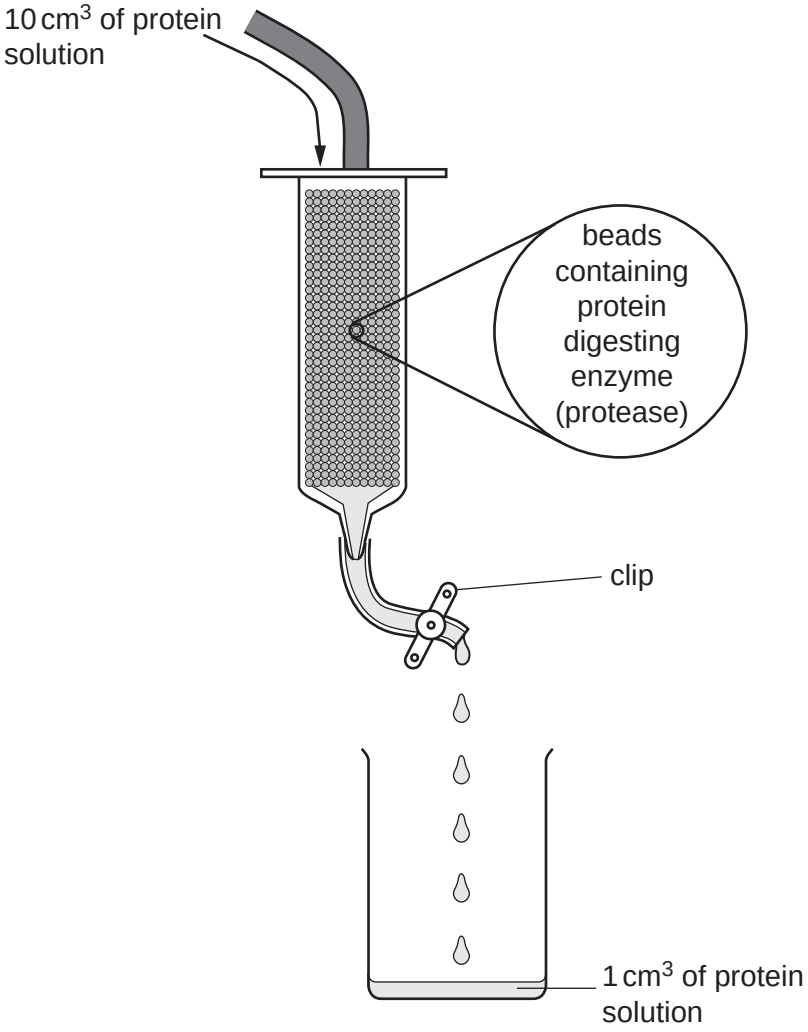


Fig. 1.3

A student poured 10 cm^3 of a solution containing 100 $mg\,dm^{-3}$ of protein into the syringe containing beads. The beads contain protease.

At first the clip was fully open and it took 6 seconds to collect a 1.0 cm^3 sample of the protein solution.

The student poured away the remaining protein solution, washed the beads and put them back into the syringe. The student repeated the procedure with fresh protein solution and slightly closed the clip so that it took 15 seconds to collect a 1.0 cm^3 sample of the protein solution.

This procedure was carried out three more times closing the clip more each time. The student measured the concentration of protein in each of the 1.0 cm^3 samples.

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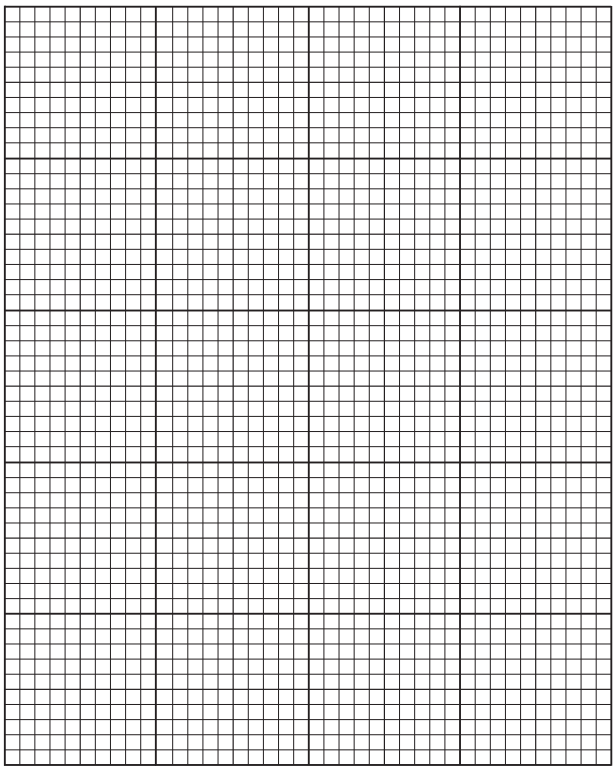
The results of the student's investigations are shown in Table 1.1.

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Table 1.1

time taken to collect 1.0 cm^3 sample of protein solution / s	concentration of protein in 1.0 cm^3 sample of protein solution / mg dm^{-3}
6	92
15	70
22	56
31	38
39	20

(b) (i) Plot a graph of the data shown in Table 1.1.



[4]

(ii) Describe and explain the trend in the results.

.....

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.....[3]

(iii) Fig. 1.4a and Fig. 1.4b show the start and finish times for the student's second investigation.

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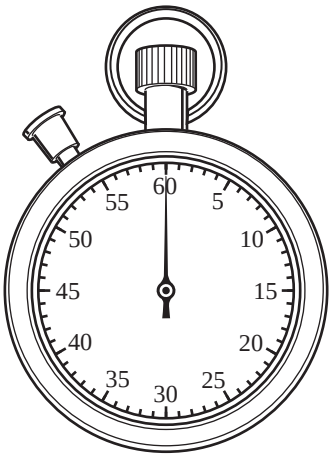


Fig. 1.4a

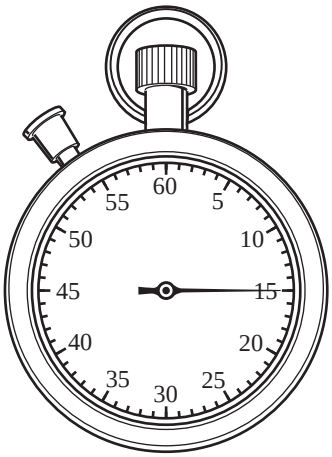


Fig. 1.4b

Use the information from Fig. 1.4a and Fig. 1.4b to calculate the percentage error of the time taken.

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percentage error .....[2]

[Total: 22]

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Question 2 starts on page 11

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2 **K1** is a stained transverse section through part of an organ from a mammal.

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Put the slide onto the microscope and move the slide to find the edge of the transverse section of the organ including the darkly stained layer.

Select a part of the section which clearly shows the edge and the darkly stained layer.

(a) Draw a large plan diagram which shows only the layers of the section visible without moving the slide to another field of view.

Use the letter **D**, with a label line, to show the position of the most darkly stained layer.

[5]

Fig. 2.1 is a photomicrograph of part of **K1**. The nuclei have been stained.

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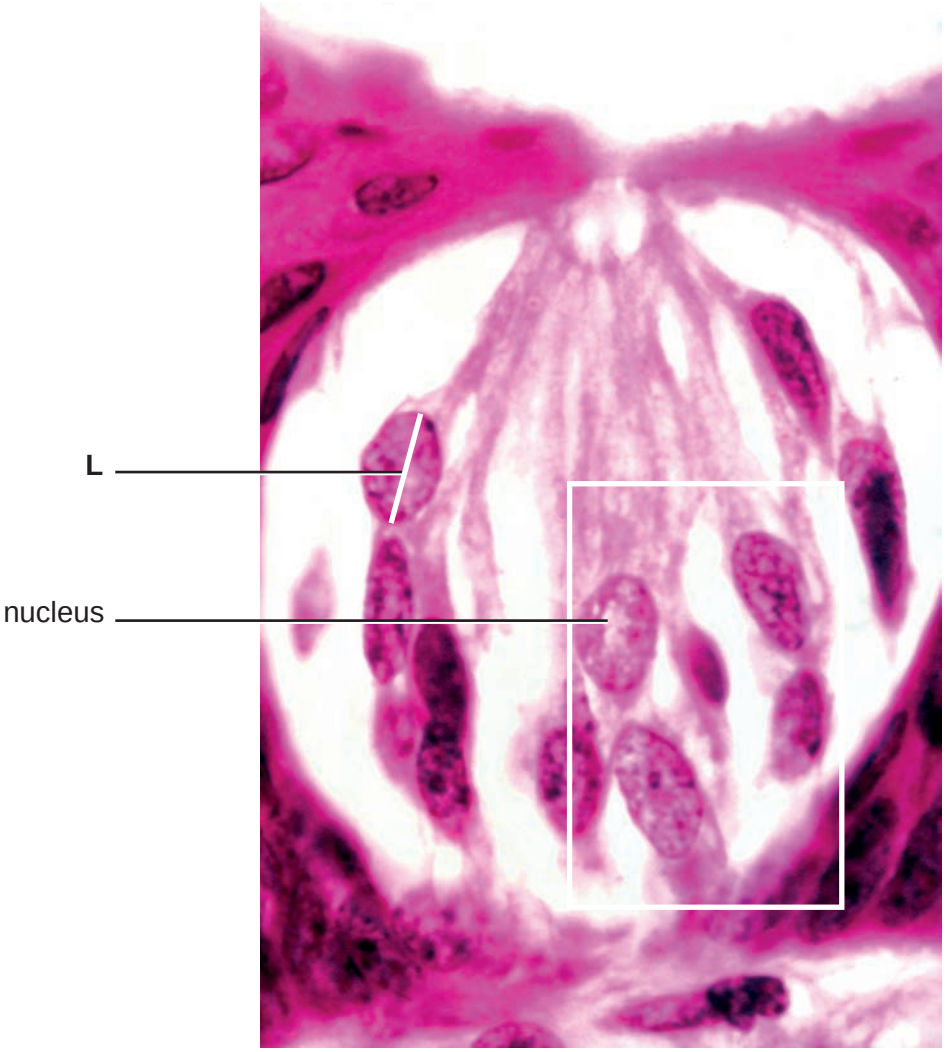


Fig. 2.1

(b) (i) Make a large drawing of all the whole nuclei shown within the area indicated on Fig. 2.1.

Label one nucleolus.

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[4]

(ii) Use the magnification to calculate the actual length of the line **L** in μm.

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..... μm [3]

Fig. 2.2 and Fig. 2.3 are photomicrographs of transverse sections through the same organ as **K1** from different mammals.

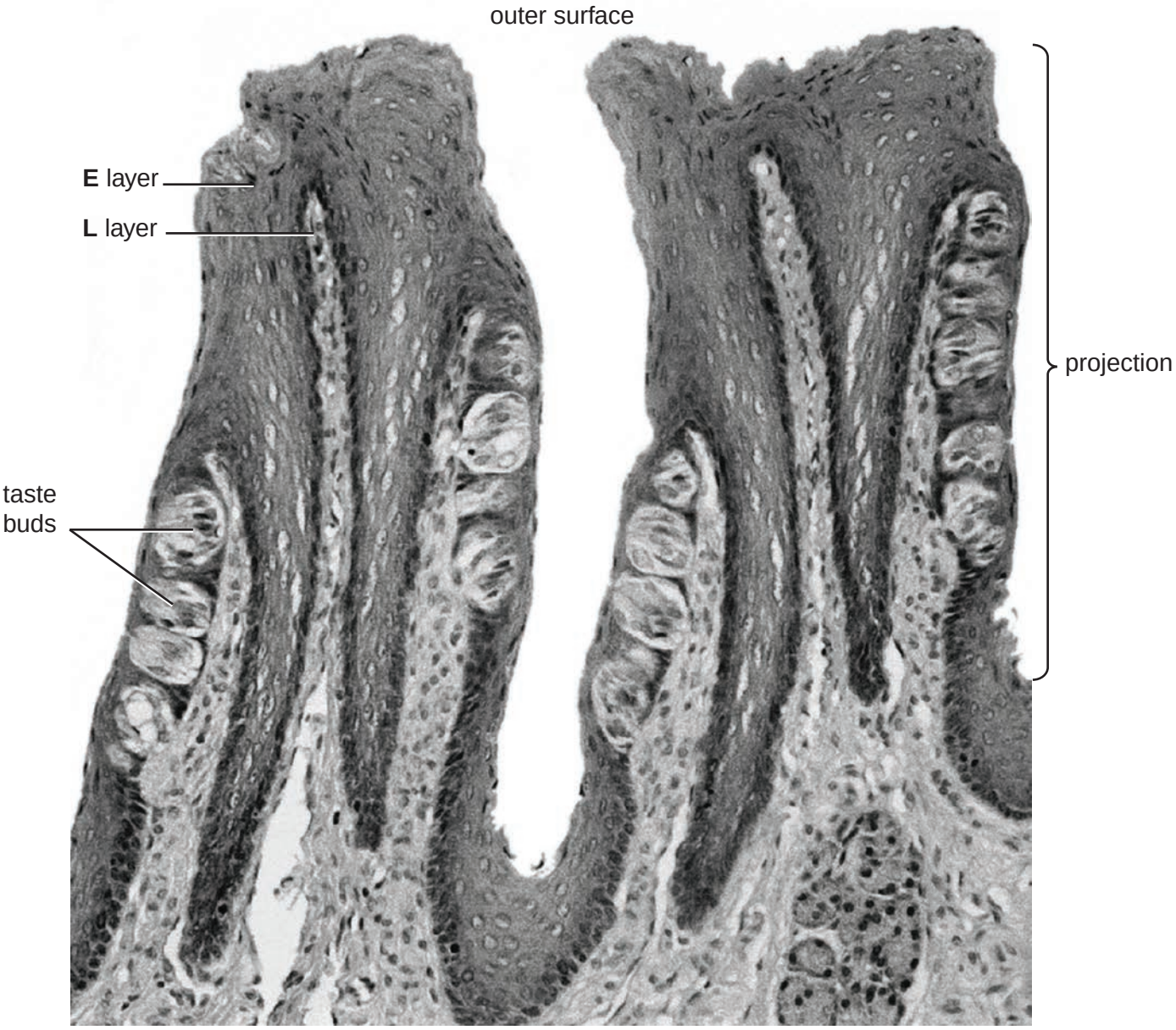


Fig. 2.2

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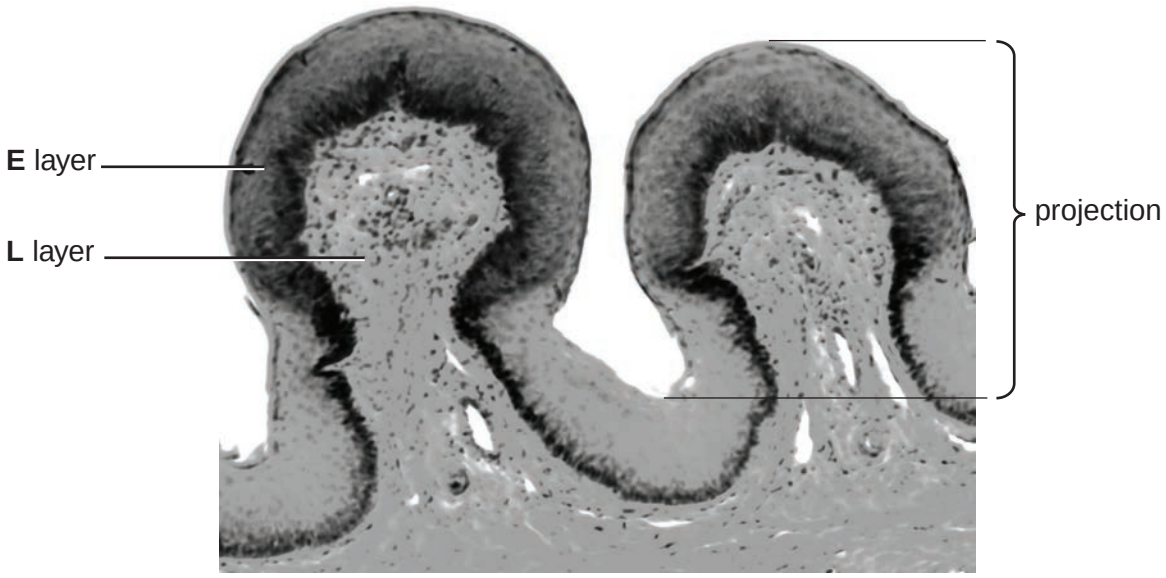


Fig. 2.3

(c) (i) Prepare the space below so that it is suitable for you to record **three** observable differences between the specimens in Fig. 2.2 and Fig. 2.3.

Record your observations in the space you have prepared.

[5]

(ii) State one observable feature of Fig. 2.2 which supports the conclusion that this is part of an organ that may absorb molecules.

Suggest how this feature may increase the rate of absorption.

.....

..... [1]

[Total: 18]

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