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

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

BIOLOGY **9700/33**

Advanced Practical Skills 1 **May/June 2012**

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.

For Examiner's Use	
1	
2	
Total	

This document consists of **12** printed pages.

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

For Examiner's Use

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 When onion cells are placed into a sodium chloride solution with a higher concentration than the cells, water leaves the vacuoles and the cells become plasmolysed. In each concentration there will be cells which may show different states of plasmolysis.

You are provided with four samples of onion tissue, each soaked in a different concentration of sodium chloride solution, labelled **S1**, **S2**, **S3** and **S4**.

labelled	concentration of sodium chloride solution / mol dm^{-3}
S1	0.8
S2	0.4
S3	0.2
S4	unknown

You are required to:

- observe and record the cells at different states of plasmolysis in **S1**, **S2**, **S3** and **S4**
- use these results to answer **(a)(iii)** concerning the unknown concentration in **S4**.

Fig. 1.1 will help you decide on the state of plasmolysis of the onion cells.

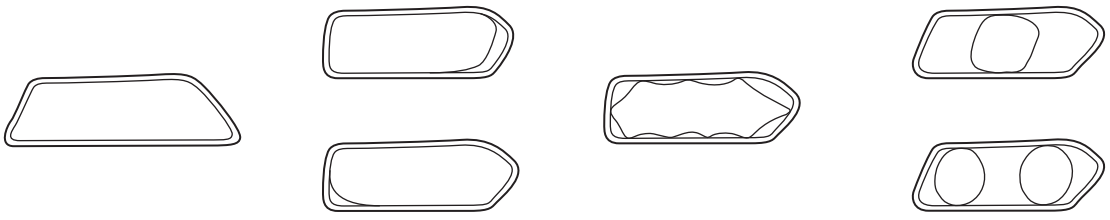

Fig. 1.1

You are advised to read steps 1 to 10 before proceeding.

Proceed as follows:

1. Label one **dry and clean** microscope slide **S1** and put the slide on a paper towel.
2. Put a few drops of the sodium chloride solution from **S1** onto the slide.

3. Remove a piece of the onion tissue from solution **S1** and, using forceps or fingers, peel off the inner concave epidermis, as shown in Fig. 1.2.

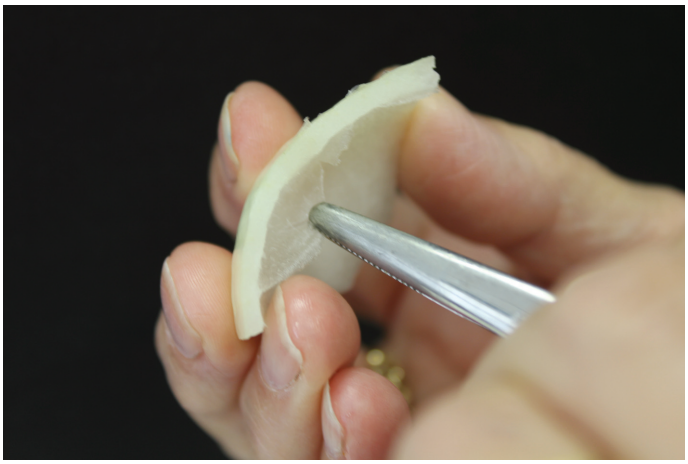

Fig. 1.2

4. Cut one piece of the epidermis that will fit under a coverslip. Replace the remaining epidermis into the solution in **S1**.

5. Place the epidermis in the sodium chloride solution on the slide as shown in Fig. 1.3. If the epidermis is folded, you may need to add more drops of sodium chloride solution so that it floats and uncurls. It is important to prevent the epidermis from drying out.

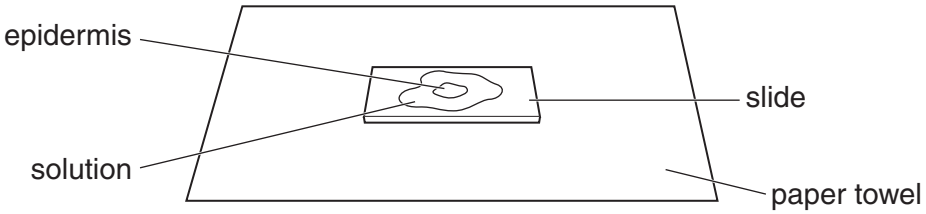

Fig. 1.3

6. Cover the epidermis on the slide with a coverslip and use a paper towel to remove any excess liquid that is outside the coverslip.

7. Observe the states of plasmolysis of the cells using the microscope.

8. You may need to reduce the amount of light entering the microscope to observe the cells clearly.

(a) (i) Describe how you will obtain accurate results to record the cells at different states of plasmolysis.

.....

.....

.....[1]

(ii) Prepare the space below for recording your results.

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[4]

9. Record your results for **S1** as you have described in **(a)(i)**.

10. Repeat steps 1 to 9 with **S2**, **S3** and **S4**.

(iii) Use your results to complete the following statement.

The sodium chloride concentration of the unknown sample, **S4**, is between

..... mol dm^{-3} and ..... mol dm^{-3}. [1]

(iv) Identify **one** significant source of error in using Fig. 1.1 to obtain your results.

.....

.....

.....[1]

(v) Suggest how you would make **three** improvements to this investigation.

.....

.....

.....

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.....

.....

.....[3]

A student investigated the effect of different sodium chloride concentrations on red blood cells.
Red blood cells are destroyed (haemolysed) when placed in a sodium chloride solution with a lower concentration than the cells.

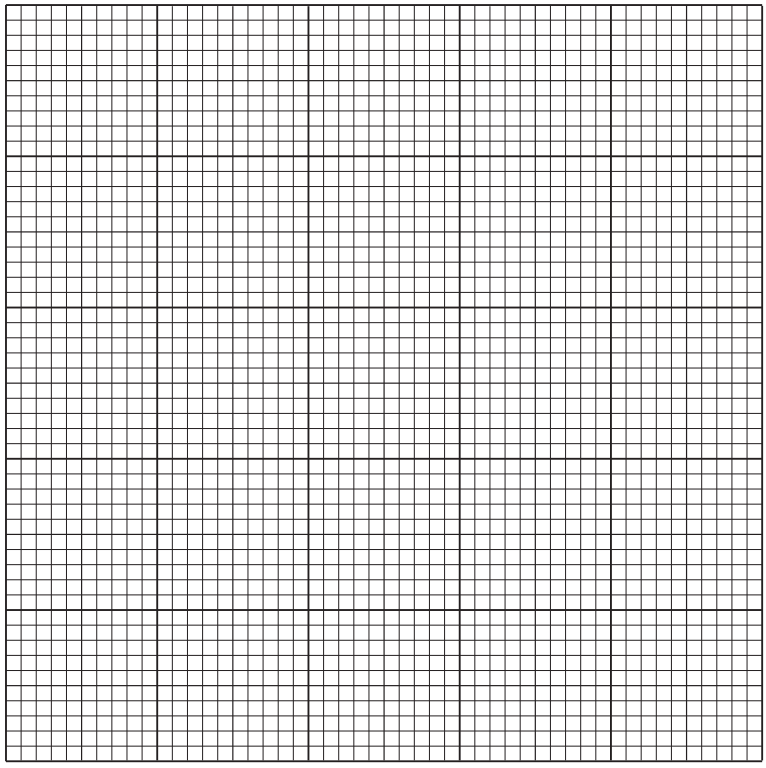
For Examiner's Use

The student's results are shown in Table 1.1.

Table 1.1

concentration of sodium chloride / $\times 10^{-2}$ mol dm^{-3}	percentage of red blood cells destroyed
5.5	100
6.0	96
6.5	74
7.0	31
7.5	10
8.0	0

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



[4]

(ii) State the sodium chloride concentration at which 50% of the red blood cells are destroyed.

Show on the graph how you obtained the concentration. [1]

Sodium chloride concentration .....[1]

(iii) Explain what is happening between the red blood cells and the external solutions when 0 and 100% of red blood cells are destroyed.

For Examiner's Use

0% red blood cells destroyed

.....

.....

.....

100% red blood cells destroyed

.....

.....

.....[3]

[Total: 19]

2 Cell surface membranes are made up of proteins and phospholipids. The phospholipids form a bilayer. Egg yolk is a source of protein and oil is a source of lipids. These can be used to investigate the effect of mixing egg yolk with oil and with water.

For Examiner's Use

You are required to observe the effect of:

- mixing oil and water
- adding egg yolk to oil
- mixing the egg yolk with oil and water.

You are provided with:

labelled	contents
Y	egg yolk (in a syringe)
O	oil
W	distilled water

You are advised to read steps 1 to 10 before proceeding.

Proceed as follows:

1. Label a test-tube, **P**, and half-fill with water.

2. Use a syringe to put 5 cm^3 of oil down the inside of test-tube **P** to form a layer on top of the water.

3. Repeat steps 1 and 2 with a test-tube, labelled **Q**.

4. As shown in Fig. 2.1, hold test-tube **P** near the top and rapidly move the test-tube five times to partly mix the oil and water.

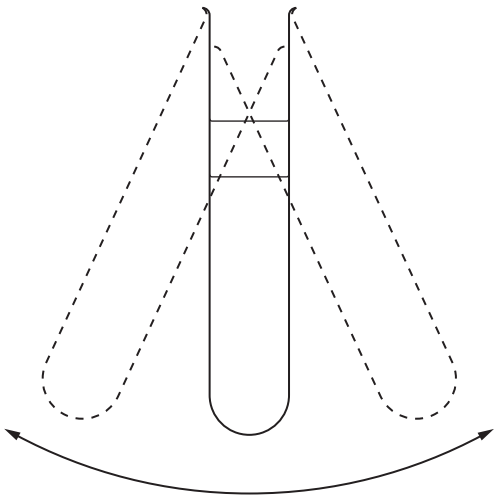


Fig. 2.1

5. Observe the contents of **P** and **Q**.

(a) (i) Complete Fig. 2.2 to show your observations.

Label and annotate **P** and **Q** in Fig. 2.2 to describe your observations.

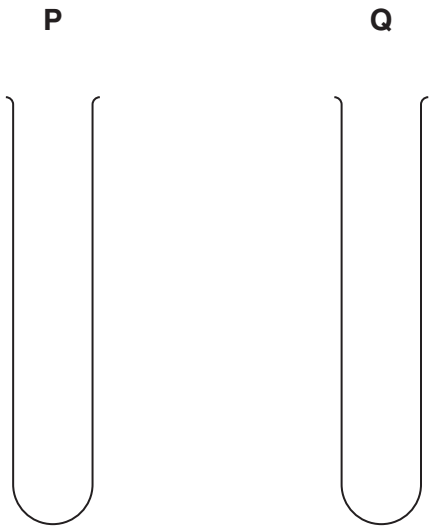


Fig. 2.2

[1]

6. Hold the syringe, labelled **Y**, in the test-tube, labelled **Q**, so that you can release one drop close to the surface of the oil.

7. Observe the contents of **Q**.

(ii) Complete Fig. 2.3 to show your observations.
Label and annotate **Q** in Fig. 2.3 to describe your observations.

Q (with egg yolk)

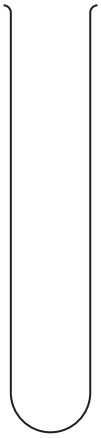


Fig. 2.3

[3]

8. As shown in Fig. 2.4 put a bung in the test-tube labelled **Q**. Shake the test-tube vigorously to mix the oil and water thoroughly so that the egg yolk is broken up.

For Examiner's Use

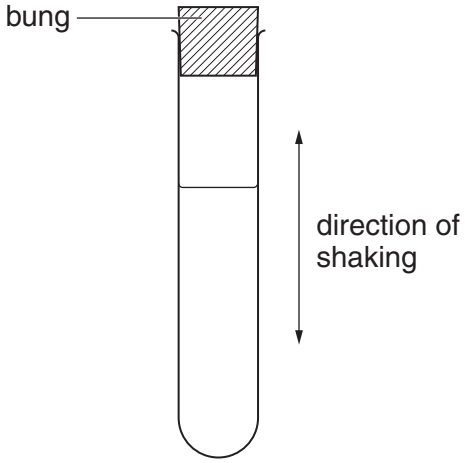


Fig. 2.4

9. As shown in Fig. 2.4 put a bung in the test-tube labelled **P**. Shake the test-tube vigorously to mix the oil and water.

10. After two minutes, observe the contents of **P** and **Q**.

(iii) Complete Fig. 2.5 to show your observations.
Label and annotate **P** and **Q** in Fig. 2.5 to describe your observations.

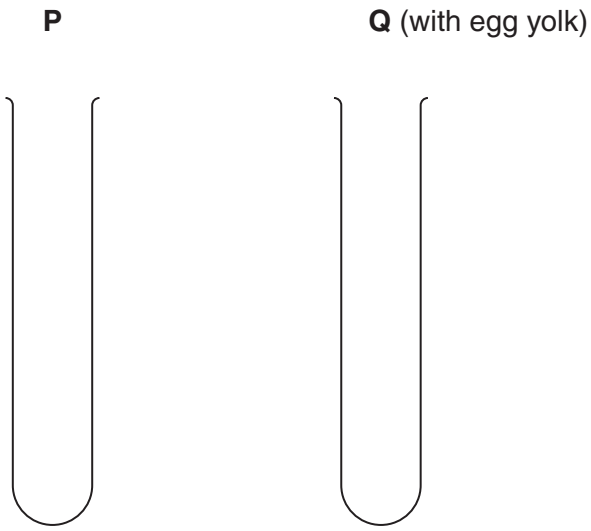
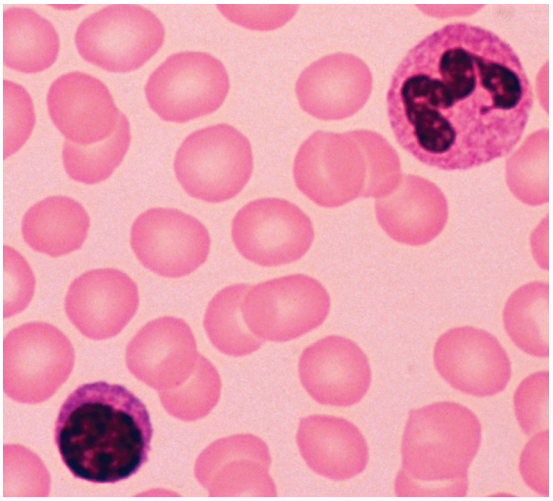


Fig. 2.5

[2]

Fig. 2.6 is a photomicrograph of normal human blood cells.



magnification × 250

Fig. 2.6

(b) (i) Make a large drawing of three different types of blood cell.

Mark on the photomicrograph the cells that you have drawn.

[4]

(ii) Prepare the space below so that it is suitable for you to show the observable differences between the red blood cells and the white blood cells shown in Fig. 2.6.

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Record your observations in the space you have prepared.

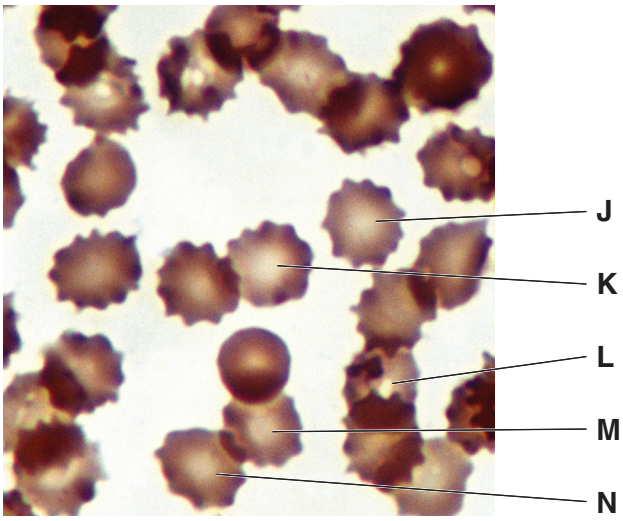
[5]

Question 2 continues on page 12

[Turn over

Fig. 2.7 is a photomicrograph of human red blood cells that have lost water through their surface membrane causing them to change shape.

For Examiner's Use



magnification × 1430

Fig. 2.7

(iii) Use the magnification to calculate the **mean actual diameter**, in μm, of a crenated red blood cell using the labelled cells in Fig. 2.7.
Draw the red blood cell, labelled **J**, and show where you measured this cell.

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

..... μm [6]

[Total: 21]