OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

BIOLOGY 2806/03/TEST

Practical Examination 2 (Part B – Practical Test)

Friday **27 JANUARY 2006** Morning 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Candidate's Plan (Part A of the Practical Examination)
Electronic Calculator
Ruler (cm/mm)

Candidate Name	Centre Number	Candidate Number

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers in the spaces provided on the question paper.
- Read the instructions and questions carefully before starting your answers.

INFORMATION FOR CANDIDATES

- In this Practical Test, you will be assessed on the Experimental and Investigative Skills:
  Skill I: Implementing
  Skill A: Analysing evidence and drawing conclusions
  Skill E: Evaluating.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
Planning	**16**	
1	**28**	
2	**16**	
TOTAL	**60**	

This question paper consists of 9 printed pages, 2 blank pages, an Insert and a Report Form.

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Answer **all** the questions.

Question 1 [50 minutes]

You are required to determine the respiratory quotient (RQ) of germinating mung bean seeds.

Mung beans have an unusually high rate of respiration. Fig. 1.1 shows a simple respirometer that can be used to measure the uptake of oxygen and the production of carbon dioxide during respiration.

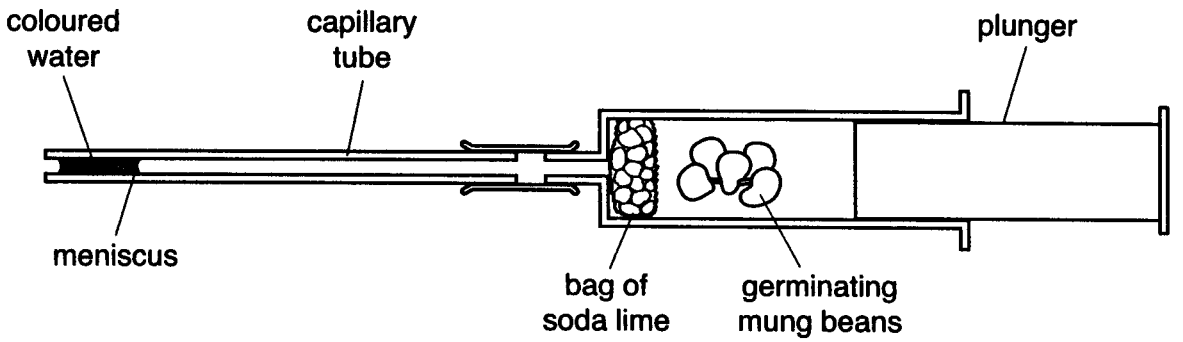


Fig. 1.1

Proceed as follows:

1 Carefully remove the green seed coats from five mung beans.

2 Handling the body of the syringe as little as possible, place the five mung beans into the syringe. This already contains some soda lime wrapped in a cotton bag. Insert the plunger **half way** into the syringe. Attach the syringe to the capillary tube securely and lay the respirometer on the bench for two minutes.

While waiting you should read instructions 3 to 7.

3 Dip the end of the capillary tube into the coloured water to pick up a drop of liquid. Wipe the end of the capillary tube with a paper towel.

4 Mark the position of the meniscus on the capillary tube using a marker pen and start a stopclock, stop watch or bench timer. Measure the total distance moved by the meniscus in mm from the starting point after 1 minute, 2 minutes, 3 minutes, 4 minutes and 5 minutes to show the progress of the meniscus.

Record your results in a suitable form in the space provided on page 4.

5 Wipe off any marks made on the capillary tube and push the plunger sufficiently to expel the coloured fluid. Remove the plunger from the syringe and carefully remove the mung beans. Use the forceps to remove the bag of soda lime and place it in the beaker labelled soda lime. Wipe the inside of the syringe with the paper towel.

6 Carefully replace the mung beans in the syringe. Replace the plunger and lay the respirometer on the bench for two minutes.

7 Repeat steps **3** and **4** recording the position of the meniscus in exactly the same way.

For Examiner's Use

(a) Record your results in a suitable form in the space below.

(b) Plot a graph of your results. Use the graph paper on page 5 opposite.

(c) The **internal** diameter of the capillary tube is 0.4 mm. Using the formula $\pi r^2 l$, where $\pi = 3.14$, calculate the volume of oxygen used up and the volume of carbon dioxide produced over five minutes.
Show your working and give the volumes to the nearest mm^3.

Oxygen

volume = ... mm^3

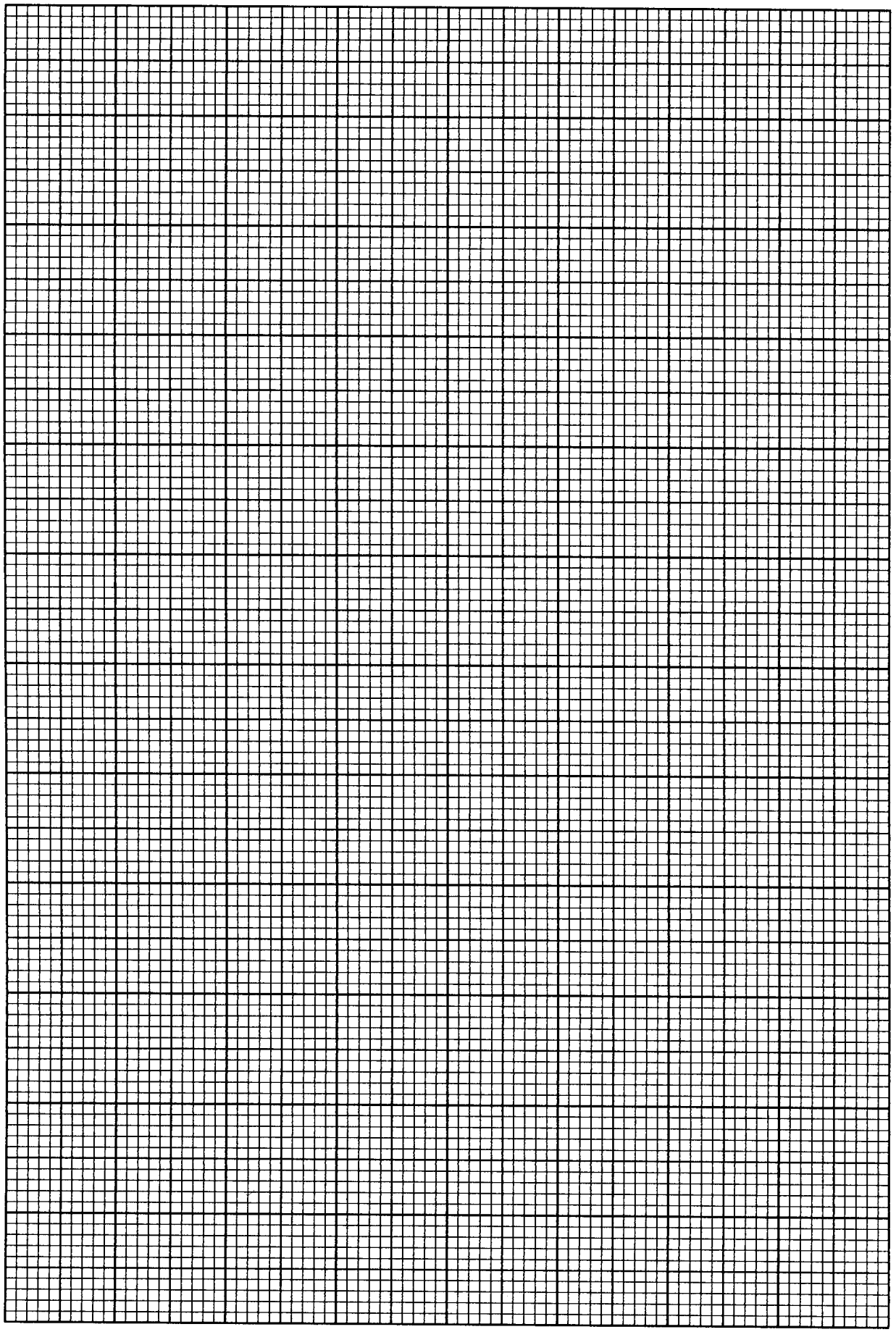
Carbon dioxide

volume = ... mm^3

(d) Calculate the respiratory quotient (RQ) of the mung bean seeds using the volumes that you have calculated in **(c)**. Show your working.

RQ = ...

For Examiner's Use



(e) The RQ of mung beans in the early stages of germination has been estimated as 0.63, but in the later stages when the first leaves appear, the RQ is 0.92.

(i) What do these values indicate about the course of respiration during germination?

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(ii) Explain why seeds often contain high proportions of lipid.

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(f) Describe a control that should have been set up in the experiment you carried out using mung beans. Explain why this control should have been included.

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(g) Apart from the limitations identified because of the lack of a control, describe **four** other limitations of the procedure used in this experiment.

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[Total: 28]

Question 2 [40 minutes]

(a) During respiration, dehydrogenase enzymes catalyse the transfer of hydrogen to the coenzymes FAD and NAD. These subsequently donate the hydrogen to oxygen via the electron transport chain. These reactions take place on the cristae of mitochondria. Dehydrogenases will also catalyse the transfer of hydrogen to triphenyl tetrazolium chloride (TTC), an artificial hydrogen acceptor, which turns red as a result.

You are provided with a mung bean **seedling** soaked in TTC. Pour off the TTC solution, carefully rinse the seedling in cold water and using forceps, place the seedling on a microscope slide. Use a hand lens to observe the distribution of any red or pink staining.

Make an **annotated** drawing of the mung bean seedling to record the position and intensity of any staining.

(b) Oxygen diffuses into seeds and carbon dioxide diffuses out. Seeds do not have specialised structures for gas exchange since, amongst other things, diffusion distances are usually short. However, in animals specialised structures have evolved for gas exchange.

Examine slide **S**, which is of healthy lung tissue, using the low and high power of your microscope. The bulk of the tissue is spongy in appearance due to the presence of numerous air passages, which end in small air sacs called alveoli.

(i) Describe and explain **three** features of lung tissue visible on slide **S** which allow for efficient uptake of oxygen and release of carbon dioxide.

description .....

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explanation .....

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description .....

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explanation .....

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description .....

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explanation .....

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(ii) Alveoli are roughly spherical and their diameters are very similar.

Explain why sections of lung tissue, such as those seen on slide **S**, appear to have alveoli of very different diameters.

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Fig. 2.1, provided on an insert, is a photomicrograph of lung tissue from a person with emphysema.

(c) Describe how the lung tissue in the photomicrograph differs from the healthy tissue on slide **S**.

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For Examiner's Use

(d) In people with emphysema, there is evidence that some cells contain increased numbers of mitochondria. When TTC is added to these cells it changes colour more quickly than when added to a control batch of cells.

Explain this observation.

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[Total: 16]

END OF QUESTION PAPER

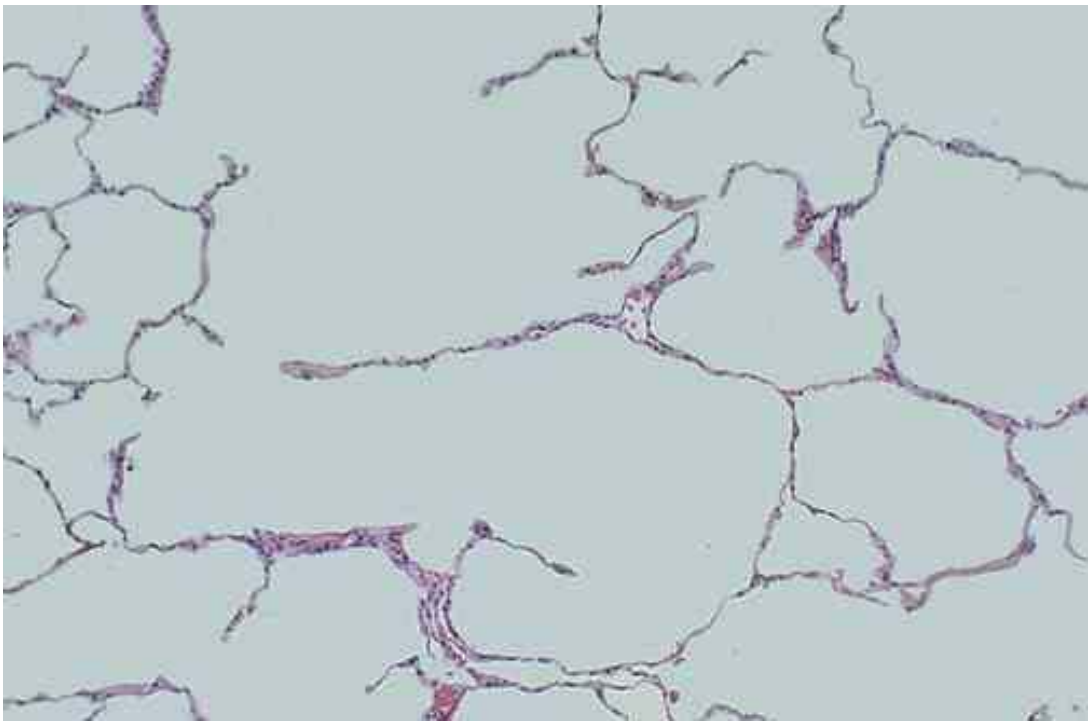

Fig. 2.1