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UNIVERSITIES OF MANCHESTER LIVERPOOL  
LEEDS SHEFFIELD AND BIRMINGHAM

## JOINT MATRICULATION BOARD

## GENERAL CERTIFICATE OF EDUCATION

## BIOLOGY

ORDINARY

Tuesday 13 June 1967 2—4-30

**Careless and untidy work will be penalized.***In the special answer-book provided, answer **Question 1** and any **four** other questions.**Credit will be given for labelled diagrams where relevant.**Any answer, either finished or unfinished, which you wish to cancel should be boldly crossed out.**Answers may be continued on the extra space provided on pages 5, 11, 13 and 20 but indication must be given as follows "Continued on page. . .".***Question 1, which is compulsory, is printed on pages 2 and 3 of the special answer-book.***specimens: Antel, Groundsel, snail & worm.*

2. In a climbing plant growing over both sides of a north-facing and a south-facing wall the sizes of many of its leaves from the sunny and shady sides were measured. The results were as follows:

	<i>Sunny Side</i>	<i>Shady Side</i>
Average length of 100 leaves	6 cm.	10 cm.
Average width of 100 leaves	4 cm.	8 cm.

- (a) What is the effect of differing light intensities on the growth of these leaves on the sunny and shady sides of the wall?
- (b) Name the nutritional process occurring within the plant which might be affected by the differences in light intensity on either side of the wall.
- (c) Explain the effect on this process in well-illuminated leaves of (i) increasing the amount of carbon dioxide present in the atmosphere to 1%, and (ii) greasing the lower surfaces of the leaves.
- (d) Draw a simplified labelled diagram of the distribution of the tissues as seen in a section of a typical leaf to show the structures involved in this process.
- (e) Name the products of this process and briefly explain how they are removed from the leaves.

**pages 4 and 5**

3. (a) (i) Give **three** differences in structure between red blood cells (corpuscles) and white blood cells (corpuscles).  
(ii) State **one** function of each of these blood cells (corpuscles).
- (b) Compare the composition of the blood flowing through (i) the pulmonary artery and the vein (portal vein) between the intestine and the liver, (ii) the aorta and the vein (renal vein) between the kidney and the inferior vena cava.
- (c) Two groups of young, newly-weaned rats were kept in isolated conditions and given specially prepared foods for a prolonged period. The rats in Batch A were fed on foods forming a well-balanced diet; the rats in Batch B were given the same foods from which all iron compounds had been extracted. After a period of time the rats in Batch B were found to be less energetic than the rats in Batch A. Give an explanation for this.

**pages 6 and 7**

4. Give a biological explanation for **each** of the following: (a) the absence of earthworms in a very dry soil; (b) the presence of large numbers of moss plants in some moist woodlands; (c) the small numbers of butterflies or moths seen in this country in winter; (d) the inclusion of a leguminous crop, e.g. clover, to improve the condition of the soil.

**pages 8 and 9**

[Turn over



5. (a) What is meant by " alternation of generations " in plants?  
 (b) Although the fern is considered to be a land plant it is dependent on surface water to complete its life history. With the help of diagrams, describe the stages of the life history to which surface water is essential and briefly indicate how the rest of the life cycle is completed. **pages 10 and 11**
6. Twenty-eight test-tubes were taken, fourteen containing a few cm<sup>3</sup> (millilitres) of milk and fourteen containing a few drops of the enzyme rennin from gastric juice. The tubes were separated into fourteen pairs (each pair consisting of one tube of milk and one of rennin), each pair being kept in a separate water bath at a controlled temperature, as indicated in the table below. When the contents were at the same temperature as the water, the rennin was added to the milk in each pair and stirred in, and the tubes containing the mixtures were replaced in the water baths. The tubes were watched to see if, and how quickly, the milk clotted, and the results were tabulated as follows:

Temperature of milk and rennin mixture in °C.		Time taken to form a clot in minutes.							
		1	2	3	4	5	6	7	8
1st Pair	5								no clot
2nd Pair	10								no clot
3rd Pair	15								no clot
4th Pair	20							X	
5th Pair	25					X			
6th Pair	30				X				
7th Pair	35	X							
8th Pair	40	X							
9th Pair	45			X					
10th Pair	50				X				
11th Pair	55								no clot
12th Pair	60								no clot
13th Pair	65								no clot
14th Pair	70								no clot

- (a) (i) Between which temperatures was the action of rennin most rapid?  
 (ii) Why was there no clotting in the first three and the last four pairs?  
 (iii) What would happen to the milk in the first three pairs if the temperature of their water baths was raised to 35° C. after the first eight minutes?  
 (iv) What would happen to the milk in the last four pairs if the temperature of their water baths was lowered to 35° C. after the first eight minutes?
- (b) (i) Suggest a possible reason why only mammals among animals produce rennin.  
 (ii) Why is it important that milk should be clotted at an early stage of gastric digestion?
- (c) Give **two** processes dependent upon enzymes in both the germination of a seed and the development of a frog's egg. **pages 12 and 13**
7. (a) (i) Make a labelled diagram to show the structure of *Euglena*; (ii) give **two** plant-like features and **two** animal features of this organism.  
 (b) Describe experiments, one for each case, that you would carry out to investigate how the following organisms respond to a stimulus of light from one side: (i) *Euglena*, (ii) an earthworm.  
 (c) Give **four** differences between animal movements and plant tropisms. **pages 14 and 15**
8. (a) (i) Make a labelled drawing of the mammalian breathing system. (ii) What features of this system enable it to permit gaseous exchange to occur? (iii) Name **two** factors which could cause a decrease in the rate of gaseous exchange and **two** which could increase the rate.  
 (b) How is gaseous exchange brought about in (i) an insect, (ii) a fish? **pages 16 and 17**
9. (a) (i) What is meant by transpiration and why must a plant transpire?  
 (ii) Describe an experiment by which you would demonstrate that the rate of transpiration in a potted plant or a cut shoot varies with the external conditions.  
 (iii) Through what leaf structures does transpiration occur?  
 (b) Explain how a green plant, planted in moist soil and sealed in an airtight glass jar on a window sill in a warm room, is able to survive in a healthy condition for many months. **pages 18 and 19**