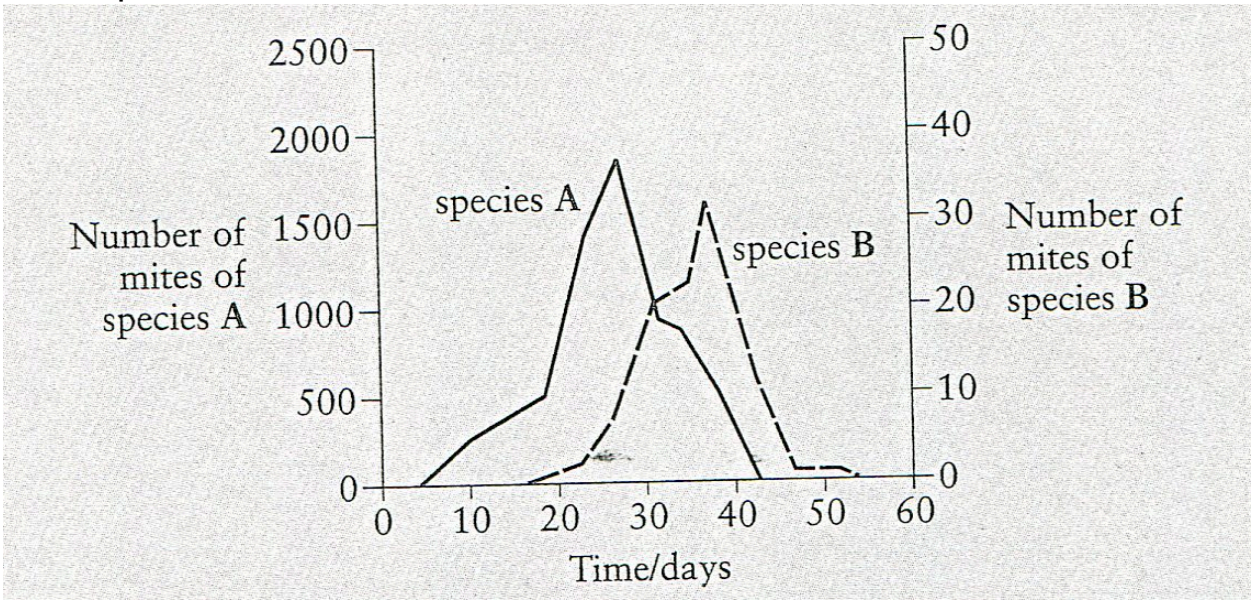
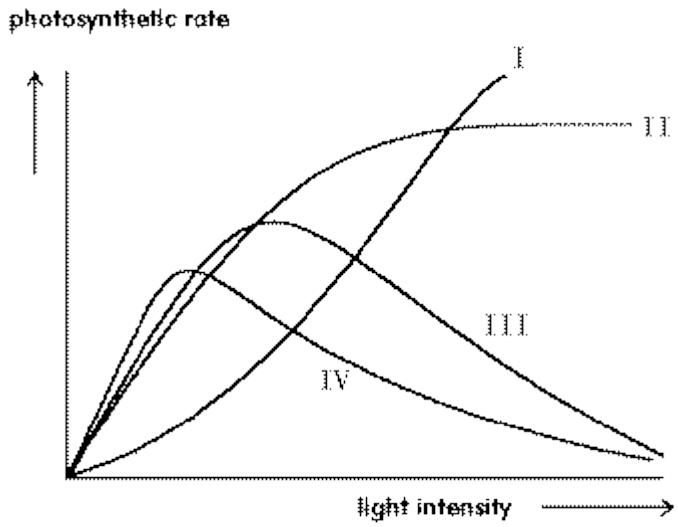
1. Mites are small arthropods with a variety of feeding habits. The relationship between the populations of two species of mite, species A and species B, was investigated in a laboratory experiment. One of these species was a herbivore and the other was a predator which fed on the herbivorous species. The graph below shows the numbers of both species over a period of time.



(a) Identify and explain two reasons why species A was most likely to have been the prey and species B the predator.

(b) Describe how one abiotic factor might have influenced the results of the investigation.

2. Four types of Phytoplankton (I, II, II and IV) were collected from different depths of the sea. For each of these types, the photosynthesis was measured, as represented in the following figure. Draw a side-view of the ocean from its surface to the ocean's floor, and label the position of each of the four phytoplankton. Include a brief justification for each.

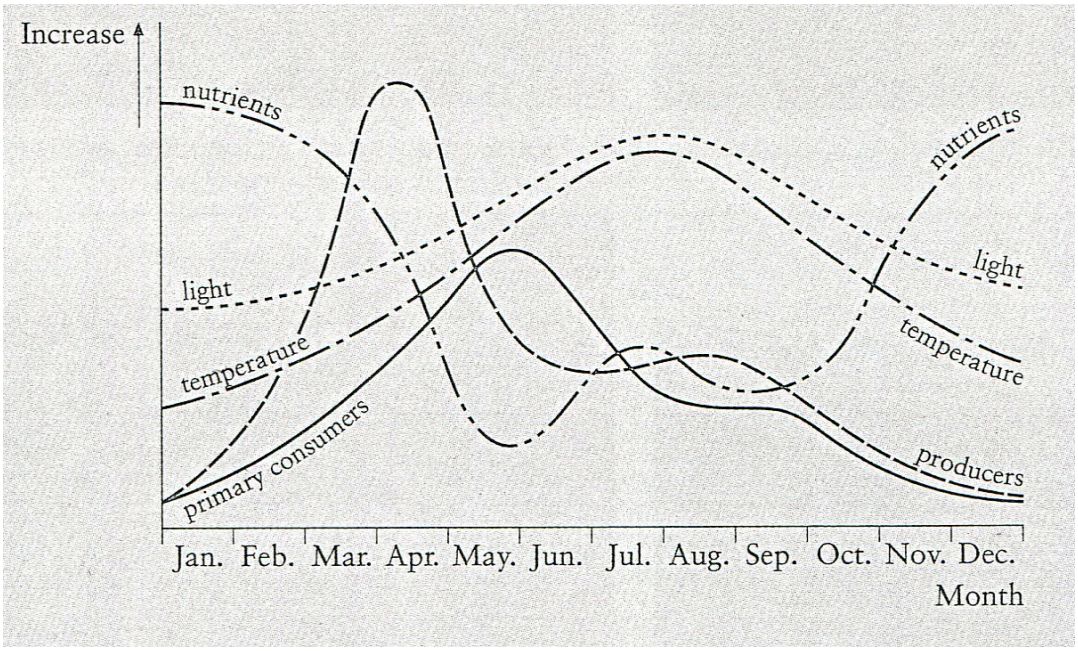


3. Ecological assemblies K through Q consist of species designated with numbers 1 through 8, present a various densities. Individual densities of these species in any particular assembly are given (as individuals per square meter) in the table. Which of the above assemblies is the least susceptible to a massive pest infection (gradation)?

Assembly	**K**	**L**	**M**	**N**	**P**	**Q**
species 1	50	92	75	0	0	0
species 2	30	4	5	25	2	65
species 3	10	0	5	20	3	20
species 4	10	0	5	20	5	10
species 5	0	1	5	20	40	3
species 6	0	1	5	5	50	2
species 7	0	1	0	0	0	0
species 8	0	1	0	0	0	0

Explain your answer.

4. The graph below shows the changes in the numbers of microscopic floating organisms and physical factors in the surface waters of the North Sea during the course of a year.



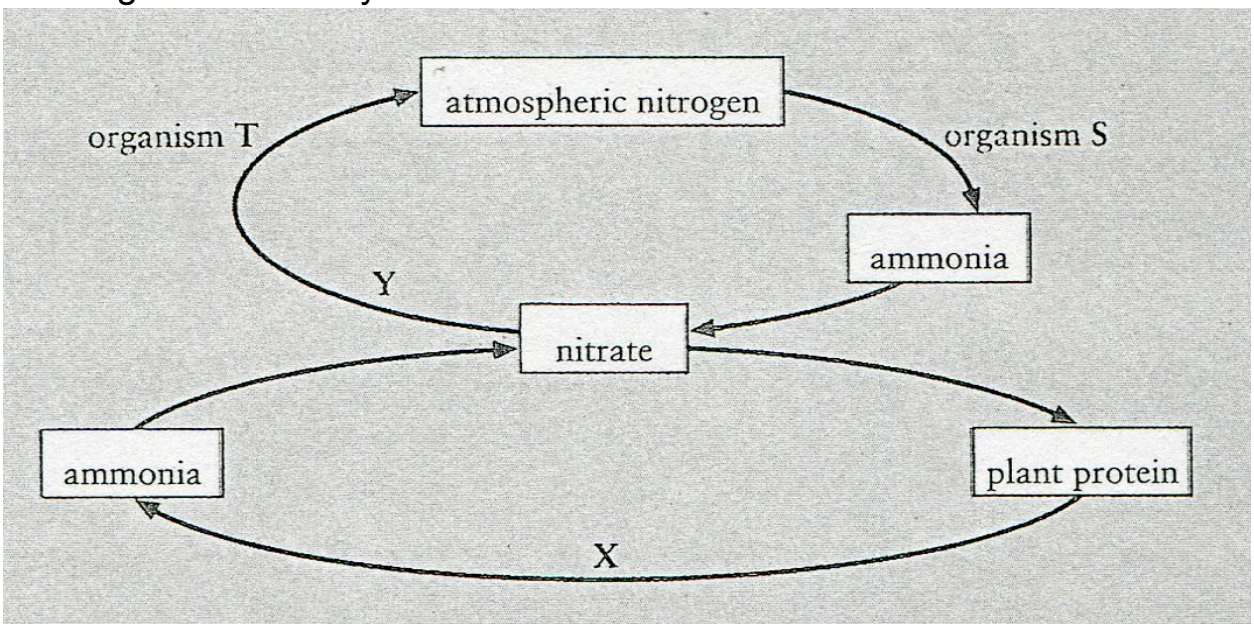
(a) Use information from the graph to suggest two explanations for each of the following,

(i) the rise in the number of producers during February and March;

(ii) the decrease in the numbers of producers during May.

(b) Explain how one abiotic factor may bring about the increase in nutrient levels of the surface waters from October to December.

5. The diagram below shows some of the processes involved in the cycling of nitrogen in an ecosystem.



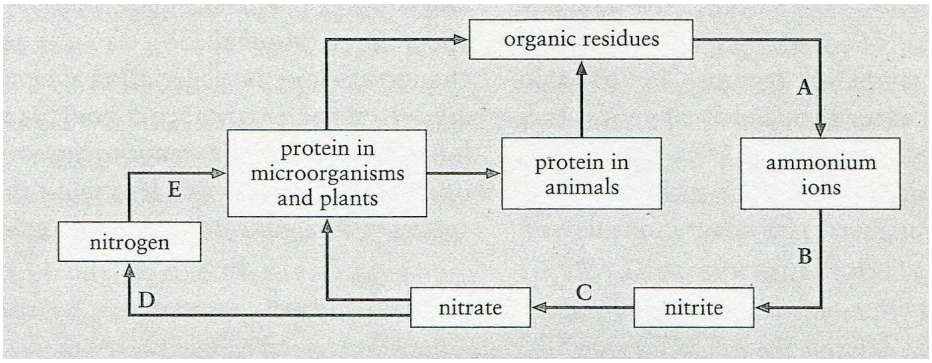
(a)

(i) State the genus of one organism represented by the letter **S** and one organism represented by the letter **T** in the diagram.

(ii) Name the processes represented by the arrows **X** and **Y**

(b) Explain how excessive use of nitrate fertilizers might lead to eutrophication of a lake.

6. a) The diagram below shows some of the processes in the nitrogen cycle.

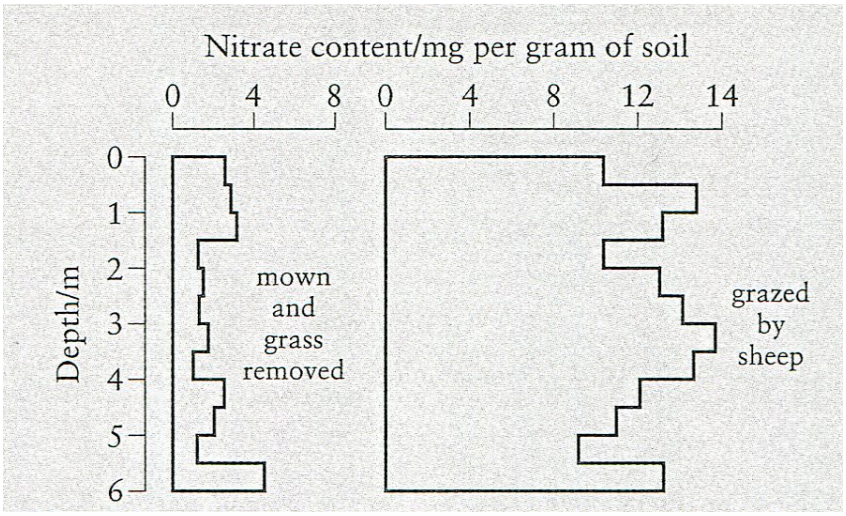


Microorganisms are involved in the stages labeled A-E.

Give the letter of **one** stage which involves:

i) nitrifying bacteria,
ii) denitrifying bacteria,
iii) nitrogen-fixing bacteria,
iv) saprophytic fungi.

b) The graph below shows the nitrate content at different depths in two similar fields. One field was mown and the grass removed; the other was grazed by sheep. Otherwise the two fields were treated identically.



Suggest an explanation for the different nitrate ‘profiles’ in the two fields.