PDST

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Leaving Certificate Ecology Fieldwork

- Student's Portfolio -

Ecosystem: _____

Location: _____

Name: _____

Date: _____

Post-Primary Resource

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The PDST would like to acknowledge the hard work and efforts of the PDST Biology Associates Team in the production of this field studies booklet, building on the work of the former Second Level Support Service and Biology Support Service.

Contents of the Student Portfolio

These contents are matched with teacher notes/helpful hints and background information in the Teacher Fieldwork Manual

1.5.1 BROAD OVERVIEW OF A SELECTED ECOSYSTEM

Note from the syllabus
** Emphasis in this special study should be placed on the **techniques of fieldwork and** the **recording and analysis of** collected **data**.*

The following points to be discussed as an introduction to the Practical Study.

What to observe in an Ecosystem
1. Form a general overview
    - **Name the type of habitat**
    - Observe if it is exposed, sheltered, flat, on a slope, what direction does it face, influence of wind – direction, intensity, drainage, etc.

2. The **diversity of flora and fauna** in the ecosystem

What to examine broadly
- A minimum of five flora and five fauna
- Name each organism – examine the range of variation of any single species e.g. height, mass, colour, etc.
- Does the same species of plant grow in bright and dark areas of the habitat e.g. ivy – note the difference in leaf size and colour in each area.

3. Look for inter-relationships between the various living organisms in the ecosystem

4. What is the influence of the non-living (abiotic) components on the flora and fauna of the ecosystem?

1.5.2 Identify a variety of habitats within the ecosystem

1. _____
2. _____
3. _____
4. _____

Site Description

Site Map/Sketch

1.5.2

Collection Apparatus Used

Name	Diagram
How used	
Type of organism collected	

Name	Diagram
How used	
Type of organism collected	

Name	Diagram
How used	
Type of organism collected	

Name	Diagram
How used	
Type of organism collected	

Collection Apparatus Used

Name	Diagram
How used	
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How used	
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1.5.2 CONDUCT A QUALITATIVE STUDY TO IDENTIFY ANY FIVE FAUNA AND ANY FIVE FLORA USING SIMPLE KEYS.

Materials/Equipment

Hand lens
Forceps
Ruler
Suitable container(s)
Identification keys

Procedure

1. Familiarise yourself with all procedures before starting.
2. Identify any five fauna in the selected ecosystem, using an identification key.
3. Note the habitat in which each organism was found.
4. Note an adaptation of any organism.
5. Record results.
6. Repeat this procedure to identify any five flora in the selected ecosystem.
7. Carefully return any collected fauna to where they were found.

Identified organisms:

(a) Organism (Fauna)	Habitat	1.5.6 Adaptation

(b) Organism (Flora)	Habitat	1.5.6 Adaptation

1.5.5 Why are structural, competitive or behavioural adaptations by organisms necessary?

1.5.6 IDENTIFY THE ROLE OF THE ORGANISMS STUDIED IN THE PATHWAYS OF ENERGY FLOW

Food Chain 1

Food Chain 2

1.5.6 FOOD WEBS

Each plant and animal that you have seen today is part of a food chain. All food chains within an ecosystem are connected because many organisms eat the same things or are eaten by the same things. List all the plants and animals that we have **discussed today**, and make a food web by drawing arrows and linking them all together.

Decomposers

Primary Producers

Herbivores

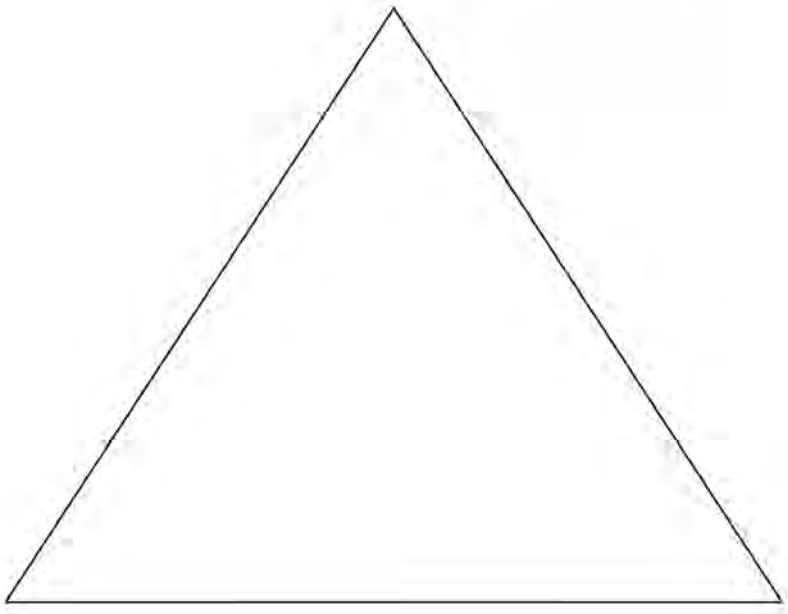
Omnivores

Carnivores

1.5.6

Food Web

Pyramid of Numbers



1.5.3 CONDUCT A QUANTITATIVE STUDY OF PLANTS AND ANIMALS OF A SAMPLE AREA OF THE SELECTED ECOSYSTEM

Because of the large variety of ecosystems and organisms available for study, many alternative quantitative study methods are possible.

(a) To calculate the frequency of an organism (suitable for plants and for sedentary and slow moving animals)

Materials/Equipment

Frame quadrat

Procedure

1. Familiarise yourself with all procedures before starting.
2. Select the sample area in the ecosystem and mark it off.
3. Decide on and record the organisms to be studied.
4. Throw a small object over your shoulder to select a random sample point. Place the quadrat at the random sample point.
5. Record the presence or absence of the named organisms within the quadrat, on the table on the next page
6. Repeat for a number of throws.
7. Use the formula below the table to calculate frequency.
8. Transfer results to graph or bar chart e.g. construct histograms of the frequency of the plants you studied, from your table of data. Put the name of the plant on the horizontal (x) axis, and % cover on the vertical (y) axis.
   Comment on the histograms obtained

   _____

   _____

   _____

9. Identify possible sources of error in your study

_____

_____

_____

_____

_____

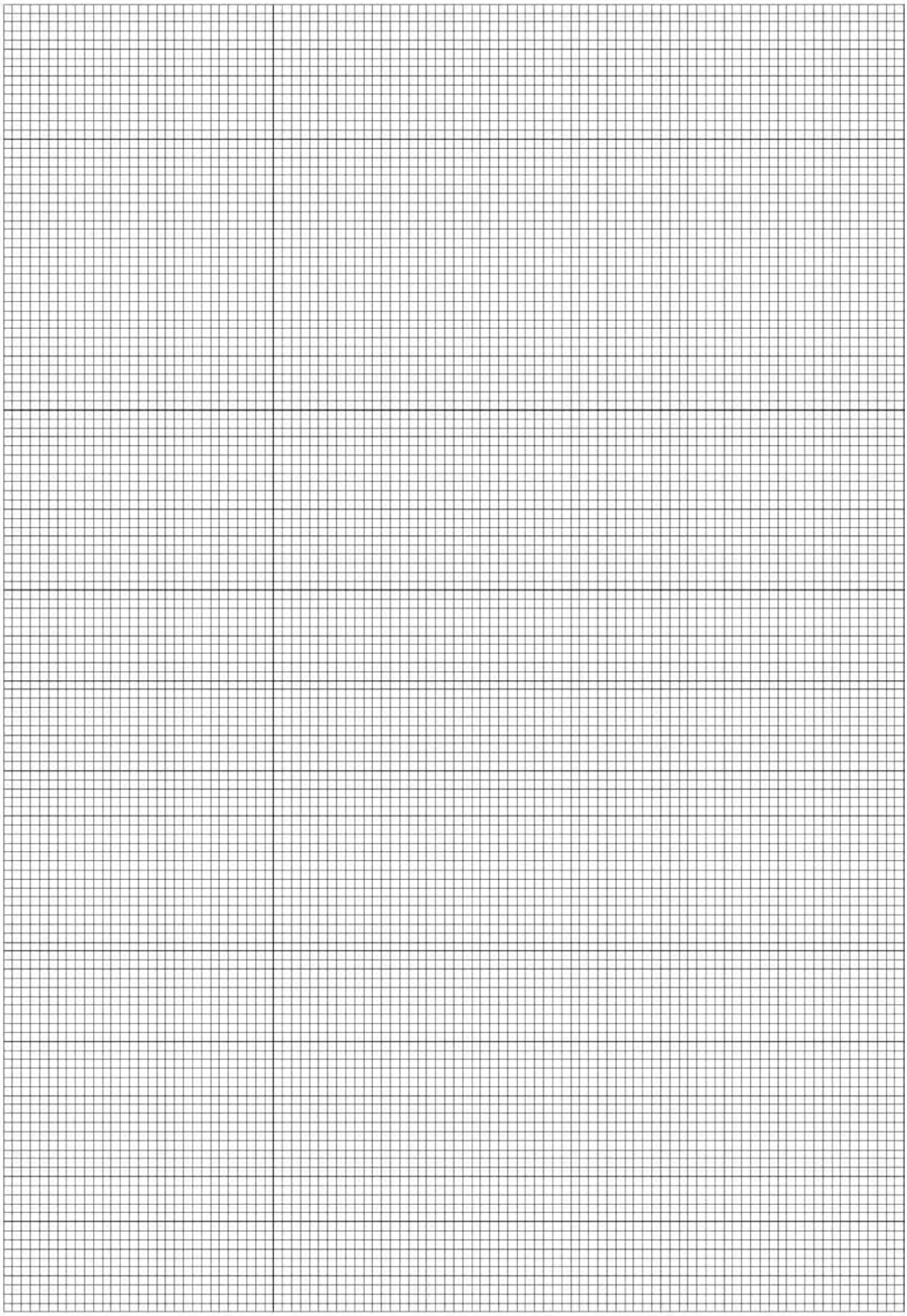
Frequency Table

Organism	Quadrat Throw										Total	Frequency	% Frequency
	1	2	3	4	5	6	7	8	9	10			

$$Frequency = \frac{No.\ of\ \ quadrats\ \ containing\ \ organism}{No.\ of\ \ quadrats\ \ thrown}$$

If percentage frequency is required use formula:

% Frequency = Frequency x 100



(b) To calculate the percentage cover of an organism (suitable for most plants)

Materials/Equipment

Grid quadrat
Needle/pencil

Procedure

1. Familiarise yourself with all procedures before starting.
2. Select the sample area in the ecosystem and mark it off.
3. Decide on and record the organisms to be studied.
4. Throw a small object over your shoulder to select a random sample point. Place the quadrat at the random sample point.
5. Lower the needle at each sampling point and note the organism(s) hit.
6. Count and record the number of hits for each organism within the quadrat, on the table on the next page.
7. Repeat for a number of throws.
8. Use the formula below the table to calculate % cover.
9. Transfer results to graph or bar chart.

   e.g. Construct histograms of the % cover of the plants you studied, from your table of data. Put the name of the plant on the horizontal (x) axis, and % cover on the vertical (y) axis. Comment on the histograms obtained

   _____

   _____

   _____

   _____

10. Identify possible sources of error in your study

    _____

    _____

    _____

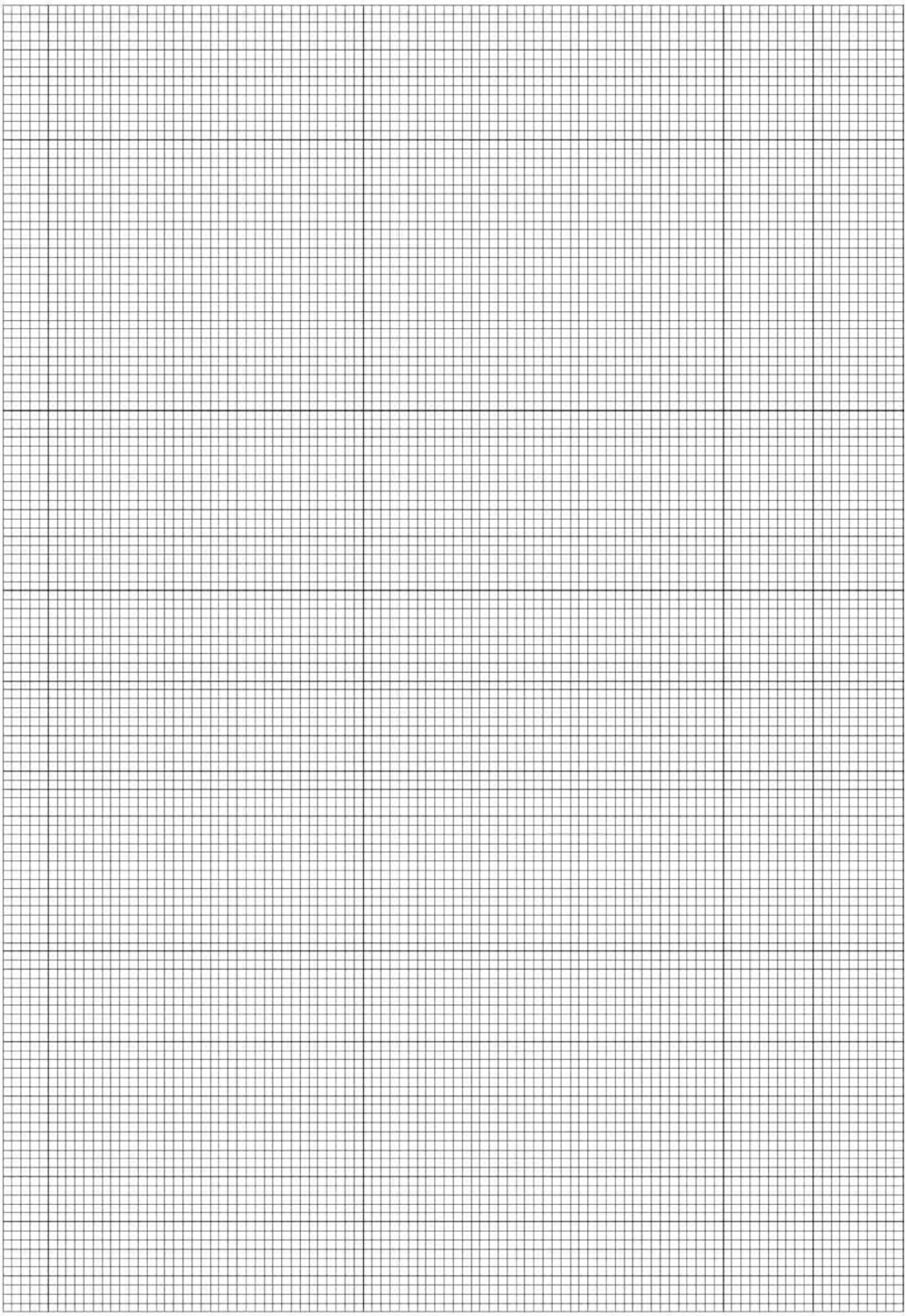
    _____

    _____

% Cover Table

Plant Name	Quadrat Throw										Total Hits	Total Points	% Cover
	1	2	3	4	5	6	7	8	9	10			

$$\% \ Cover = \frac{No.of\ Hits}{Total\ no.\ of\ points} \ X\ 100$$



(c) To calculate the population density of an organism (suitable for plants and for sedentary and slow moving animals)

Materials/Equipment

Frame quadrat

Procedure

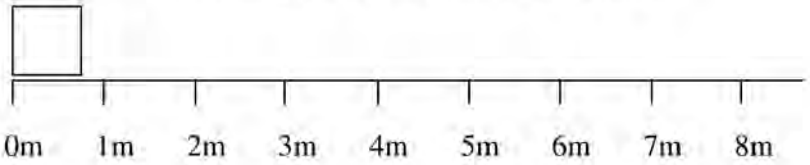
1. Familiarise yourself with all procedures before starting.
2. Select the sample area in the ecosystem and mark it off.
3. Decide on and record the organisms to be studied.
4. Throw a small object over your shoulder to select a random sample point. Place the quadrat at the random sample point.
5. Count and record the number of the named organisms within the quadrat, on the table on the next page.
6. Repeat for a number of throws.
7. Calculate the average number of organisms per quadrat. If you are using a 0.5m X 0.5m quadrat you will have the number of organisms per $0.25m^2$.
8. Calculate the number of organisms per m^2 (density).

Population Density

Organism Name	Quadrat Throw										Total Number	Average No. per Quadrat	Density (No. per m^2)
	1	2	3	4	5	6	7	8	9	10			

(d) To conduct a quantitative study of organisms along a belt transect (suitable for areas where there is an obvious environmental gradient or an unequal distribution of organisms)

Materials/Equipment: Tape measure (30 m)
2 tent pegs
Frame quadrat/grid quadrat and needle



Procedure

1. Familiarise yourself with all procedures before starting.
2. Select the sample area in the ecosystem and stretch the tape across it.
3. Fix the tape at either end with tent pegs so that it remains taut.
4. Decide on and record the names of the organisms to be studied on the table on the next page
5. Place the quadrat at the 0 mark of the tape. Note and record *either* the % cover or the number of the named organisms in each quadrat, on the table on the next page.
6. Repeat at suitable intervals along the tape.
7. Record your results on the table on next page
8. Transfer results to bar charts or belt transect diagram. Putting distance on the horizontal axis.
9. Comment on your results including any possible sources of error _____

_____

_____

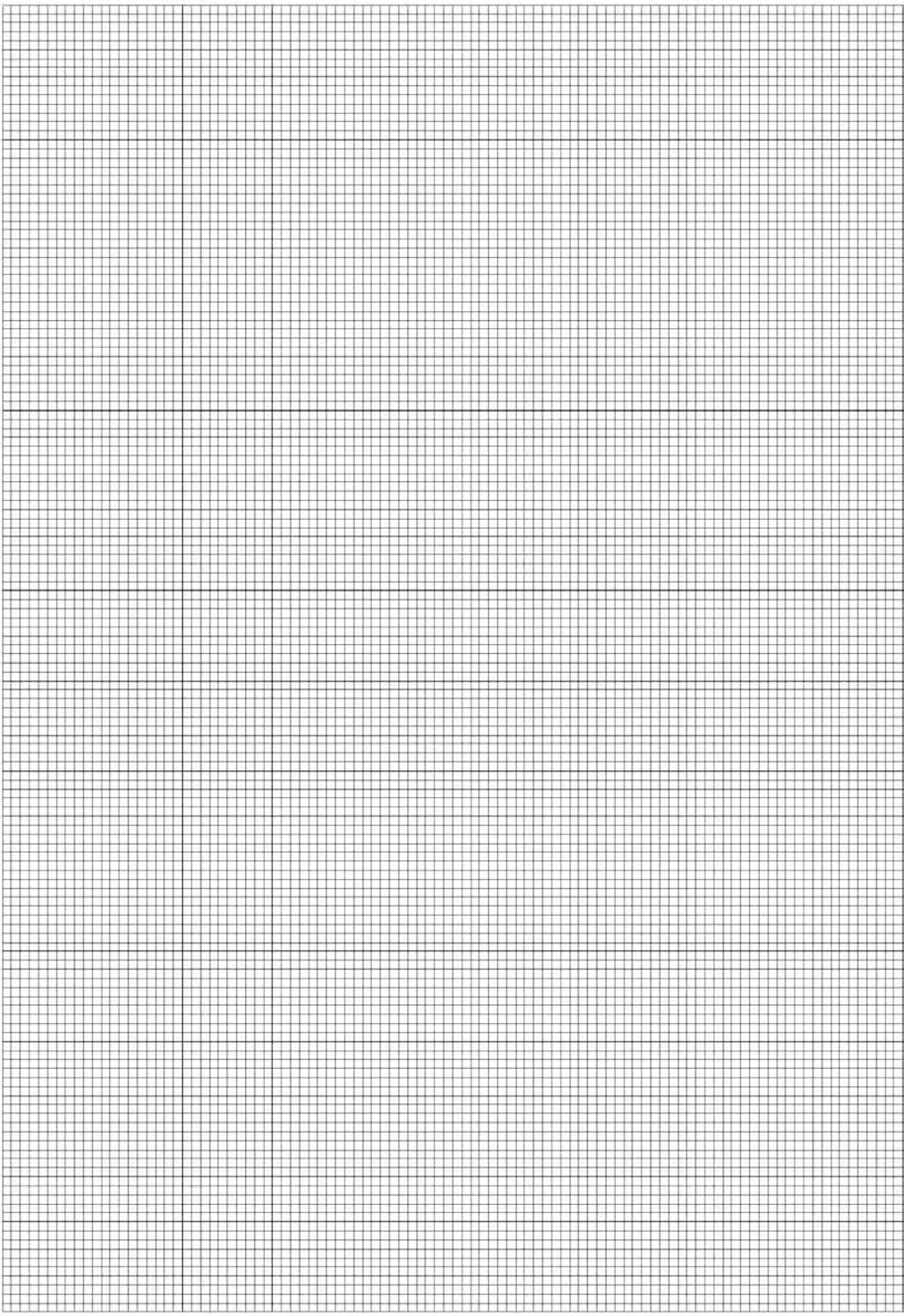
_____

Record of % Cover or Number of a named organism in each quadrat along the transect

Organism Name	Position of Quadrat on Belt Transect										
	0m										
Abiotic Factor (See P26/27)	**Appropriate measurements and units for the selected abiotic factor**										

If calculating the % cover using a grid quadrat and needle the following formula may be used

$$\% \text{ Cover} = \frac{\text{No. of hits} \times 100}{\text{No. of points on quadrat}}$$



(e) To calculate the population of an animal using the capture-recapture technique (suitable for mobile animals)

Materials/Equipment

Suitable markers

Procedure

1. Familiarise yourself with all procedures before starting.
2. Select the sample area in the ecosystem and mark it off.
3. Decide on the animal to be studied.
4. Search the area for the selected animal. Mark each animal found in a suitable way.
5. Count and record the number of animals captured and marked. Replace each animal where it was found.
6. Return to the area the following day. Search for animals in the same way. Count and record the total number of animals recaptured.
7. Count and record the number of marked animals in the recapture sample. Replace each animal where it was found.
8. Use the formula below to calculate the total number of animals in the sample area.

Result

Number of animals captured and marked on 1st visit	
Number of animals captured on 2nd visit	
Number of marked animals in the recapture sample	
Total population of animals	

$$\text{Total Population} = \frac{\text{No. captured and marked on 1st visit} \times \text{No. captured on 2nd visit}}{\text{Number of marked animals in the recapture sample}}$$

Conclusion/Comment including possible sources of error _____

_____

_____

_____

FACTORS AFFECTING THE ECOSYSTEM

Plants are primary producers. Certain factors will determine the type of plants that will grow in an ecosystem. This in turn will influence the invertebrates and mammals that live and feed in the area.

These factors may be:

Environmental – Abiotic (non-living)
– Biotic (living)

Edaphic (soil)
Climatic

1. EDAPHIC FACTORS

- **Soil pH**

We can measure the soil pH by taking a teaspoon of soil, put it in a jar and add distilled water. Use universal indicator paper, and check the pH using the colour chart.

What is the soil pH?
How does soil pH affect what grows here?

- **Soil Temperature**

Take the soil temperature with a soil thermometer

What is the soil temperature?
How does the soil temperature affect the site?

2. CLIMATIC FACTORS

Climatic Factor	Effect on the Study Site

3. ABIOTIC (NON-LIVING) FACTORS

Non-living factors that will affect the study area include pH, temperature (air and ground or aquatic), light intensity, water current, air current, dissolved oxygen, mineral content, percentage air in soil, percentage water in soil, percentage humus, salinity, degree of exposure, slope

Abiotic factors in your ecosystem	Effect on the Study Area

4. BIOTIC FACTORS

There are several living factors that may affect the study site. Some biotic factors are natural, such as competition, parasitism and predation. Other factors are human in origin and may be detrimental to an ecosystem. These include presence of pollutants, burning, deforestation, invasive species, mowing/overgrazing by animals, etc.

Can you see any evidence of these or similar activities?

List and discuss the issues involved?

Biotic Factor	Evidence	Effect on the Site

5. CONSERVATION

Give reasons why you think that ecosystems e.g. woodlands, should be conserved?

_____

_____

_____

6. CONTEMPORARY ISSUES

What local ecological issues may affect the survival of your selected ecosystem?

Ecological Issue	Effect on selected ecosystem

1.5.4 INVESTIGATE ANY *THREE ABIOTIC FACTORS* PRESENT IN THE SELECTED ECOSYSTEM, AS LISTED RELATE RESULTS TO CHOICE OF HABITAT SELECTED BY EACH ORGANISM IDENTIFIED IN THIS STUDY

Abiotic factors as listed in the syllabus:

pH, temperature (air and ground or aquatic), light intensity, water current, air current, dissolved oxygen, mineral content, percentage air in soil, percentage water in soil, percentage humus, salinity, degree of exposure and slope.

Materials/Equipment

Equipment to measure the chosen abiotic factors.

Procedure

1. Familiarise yourself with all procedures before starting.
2. Choose any three abiotic factors present in the selected ecosystem from the list above.
3. Measure the abiotic factors for the habitat of each of the identified organisms by using the appropriate equipment and following the relevant instructions.
4. Record results on the table below.
5. Relate results to the choice of habitat by commenting on the suitability of each habitat for the organism – chart on next page

Results

Habitat	
Organism Name	Abiotic Factors and Measurements (units)

Comments/Conclusions --- include any possible sources of error in your study

Organism	*Comment on the relationship between choice of habitat selected by organism and the abiotic factors studied*

Analysis and Assessment of Results

1.5.3 Overall Possible Sources of Error during the Field Trip (e.g. human error, seasonal variation, accidental discovery, limitation of sample size, etc.)

Relevance of reports in everyday life e.g. Environmental Impact Statement

Identification of local ecological issue(s).

Human Impact on the Ecosystem

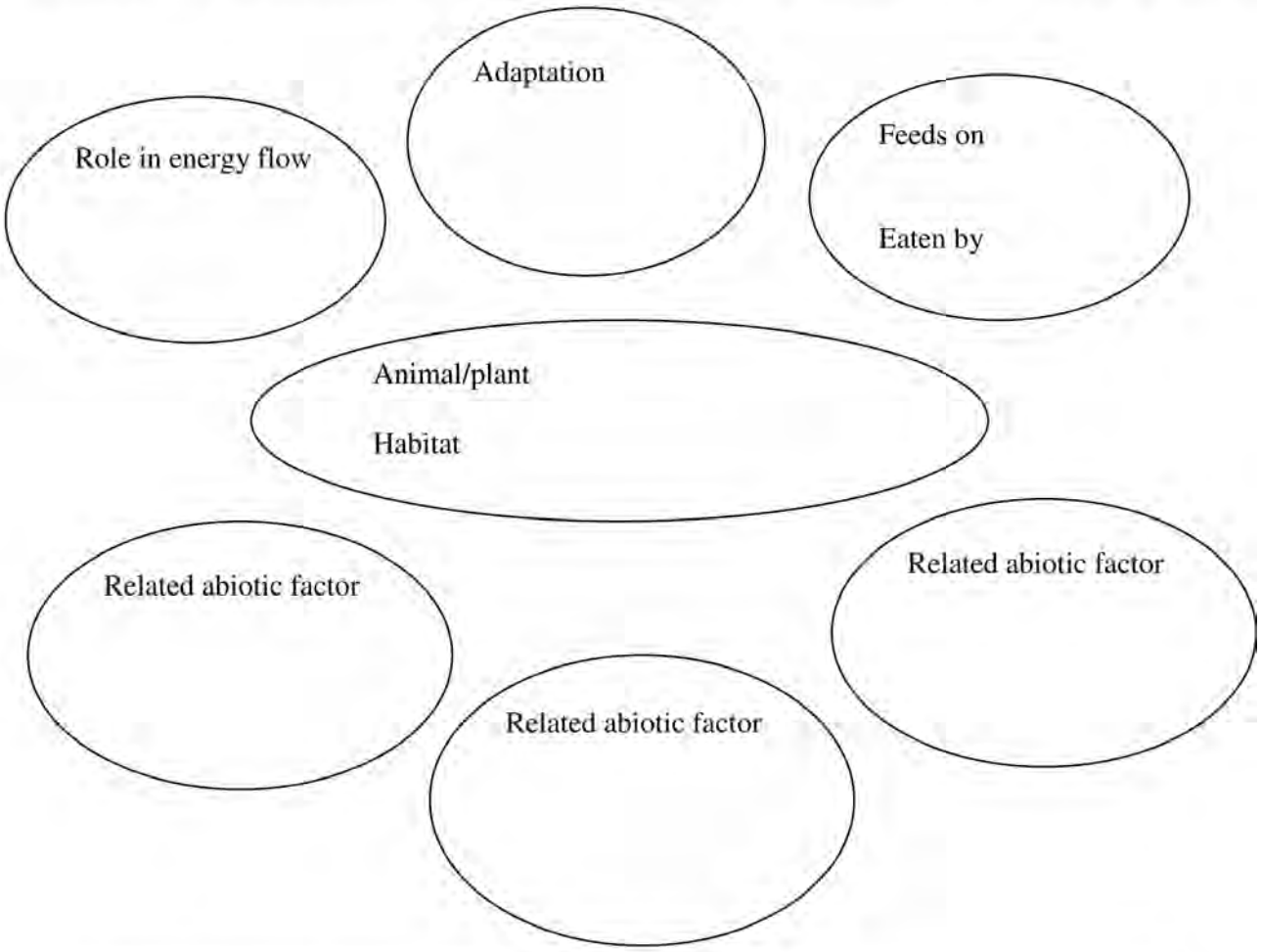
Example of pollution

How does it effect the ecosystem?

How can it be remedied?

Overall comments on your Field Study – include any links to other parts of the LC Biology Syllabus

Plant/Animal Identification Sheet



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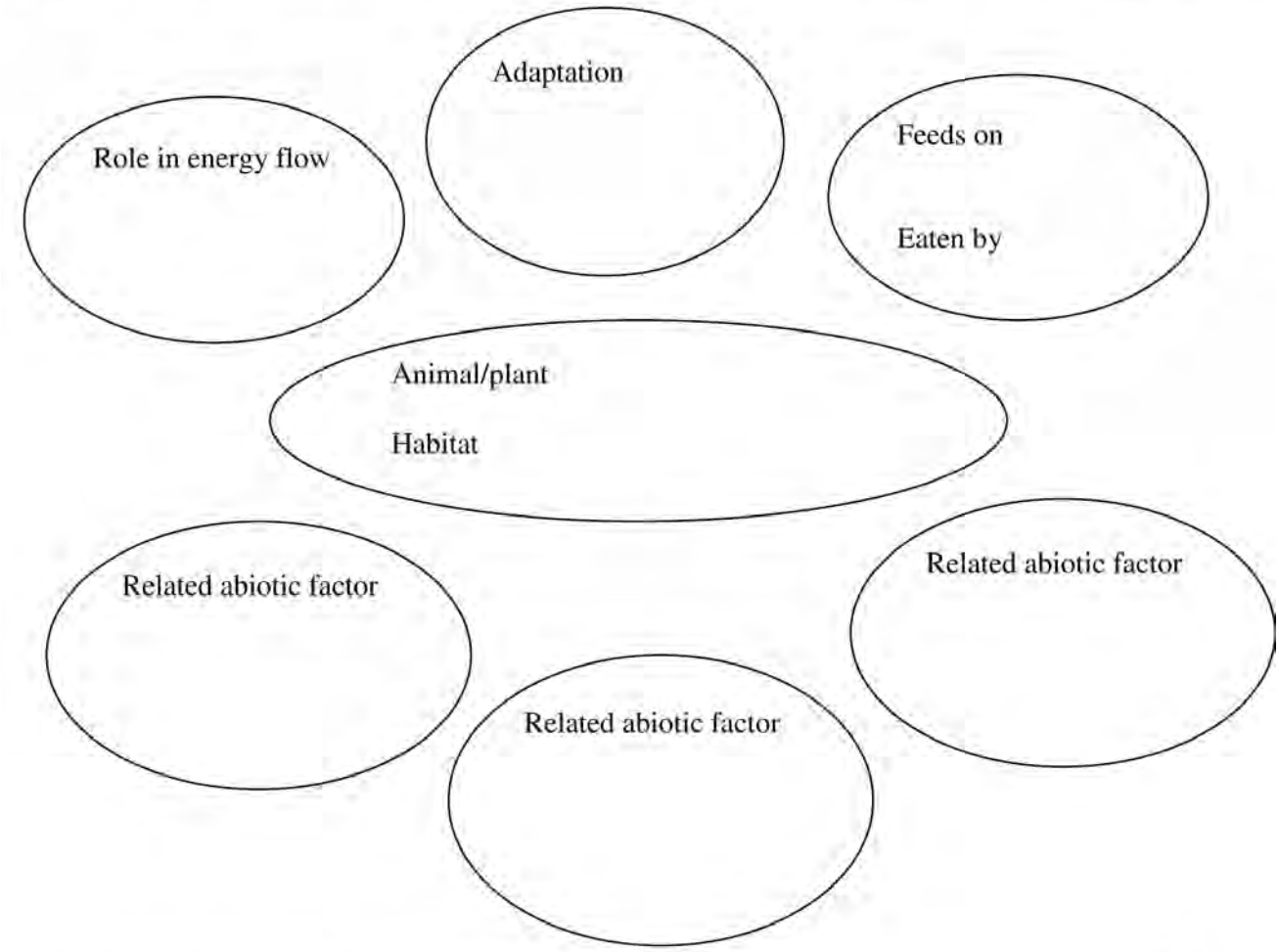

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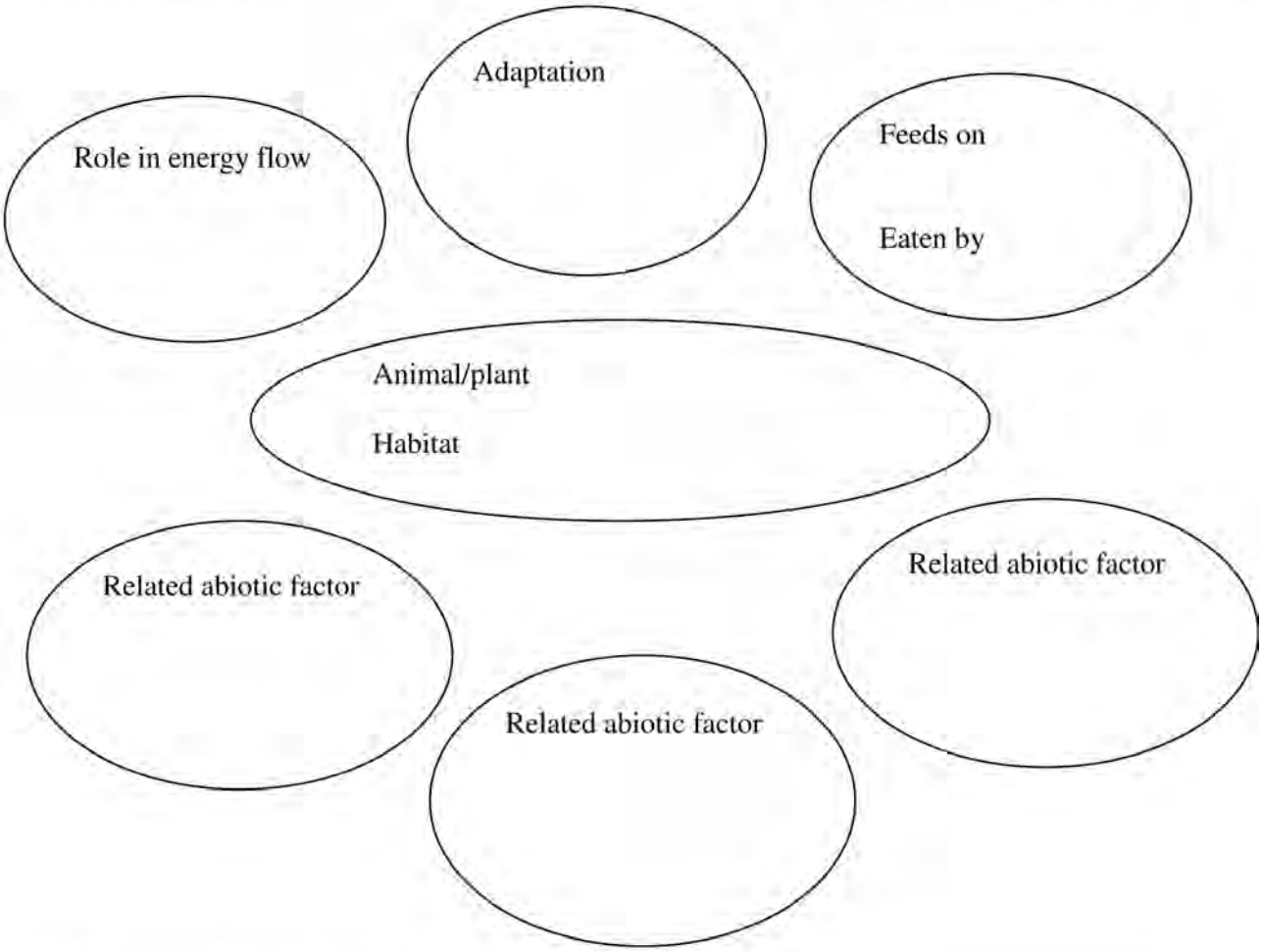

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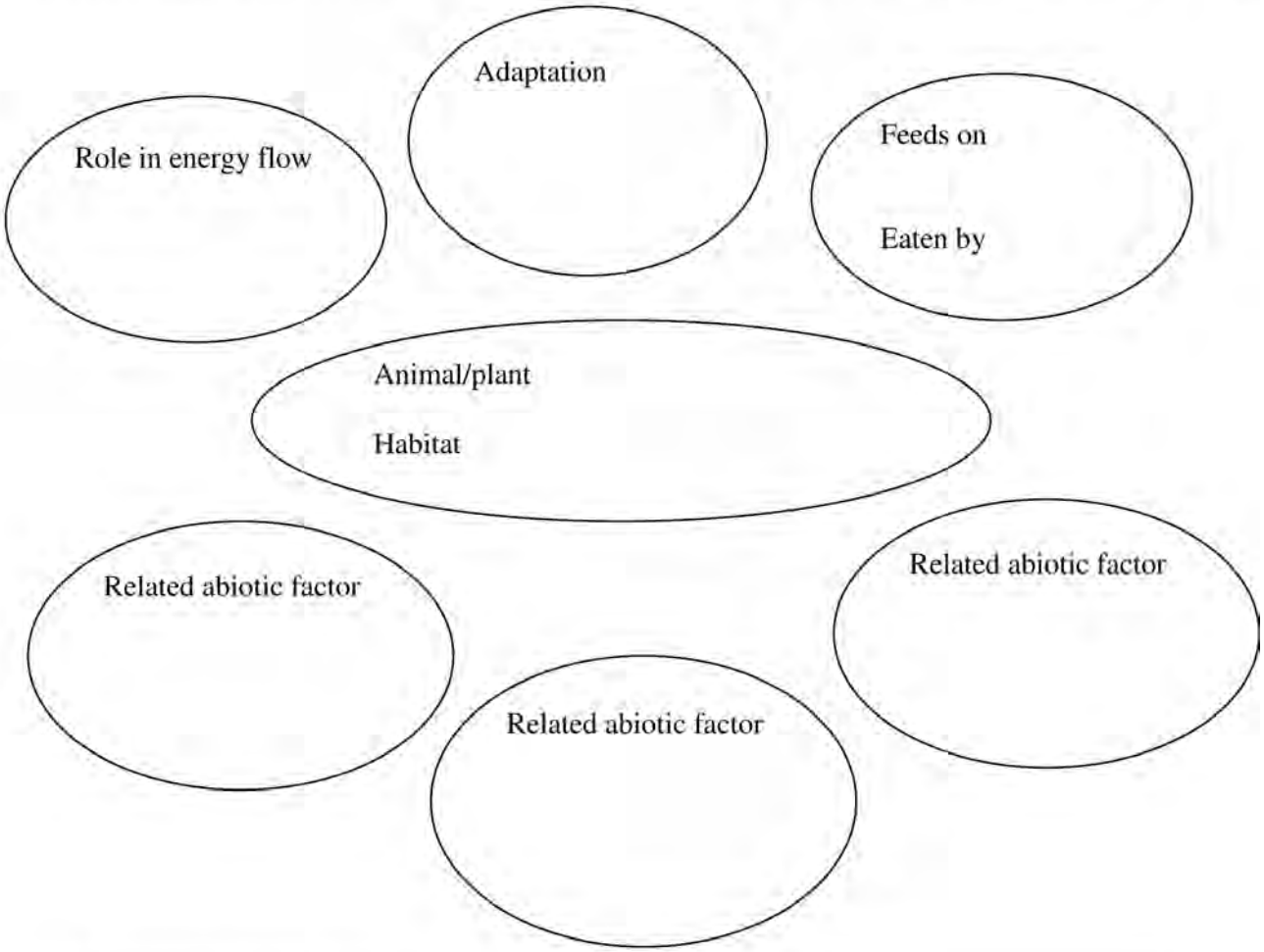

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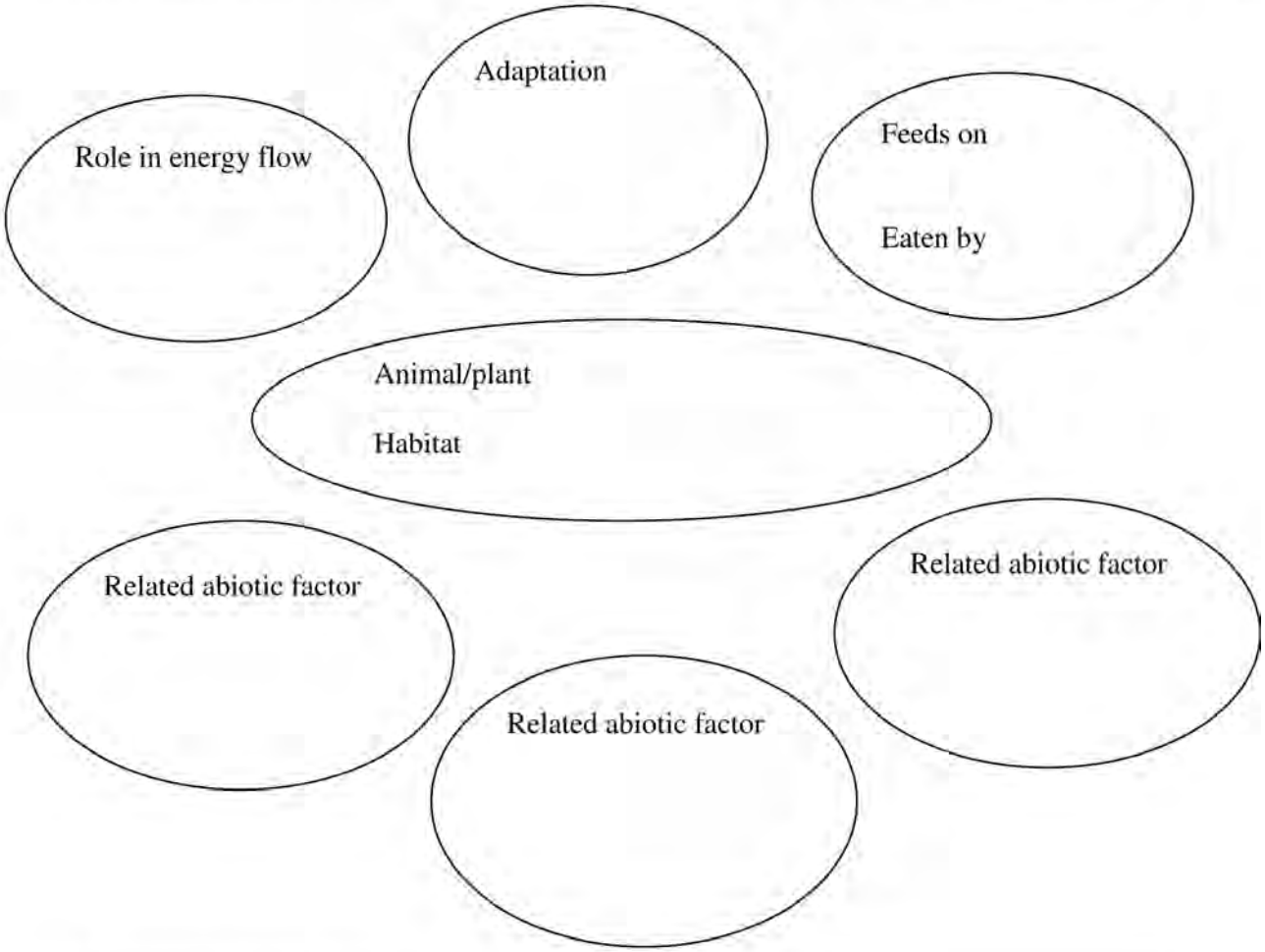

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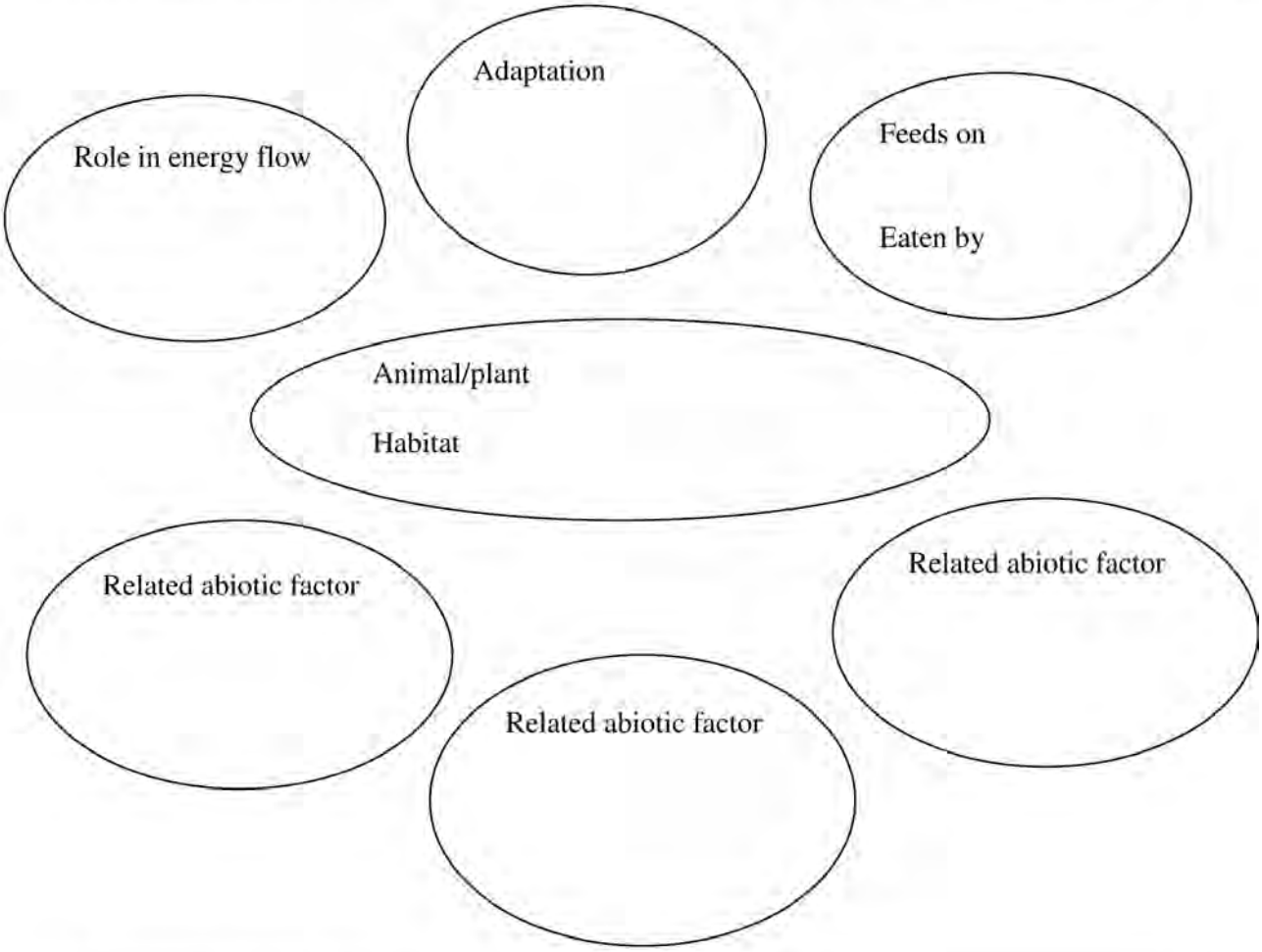

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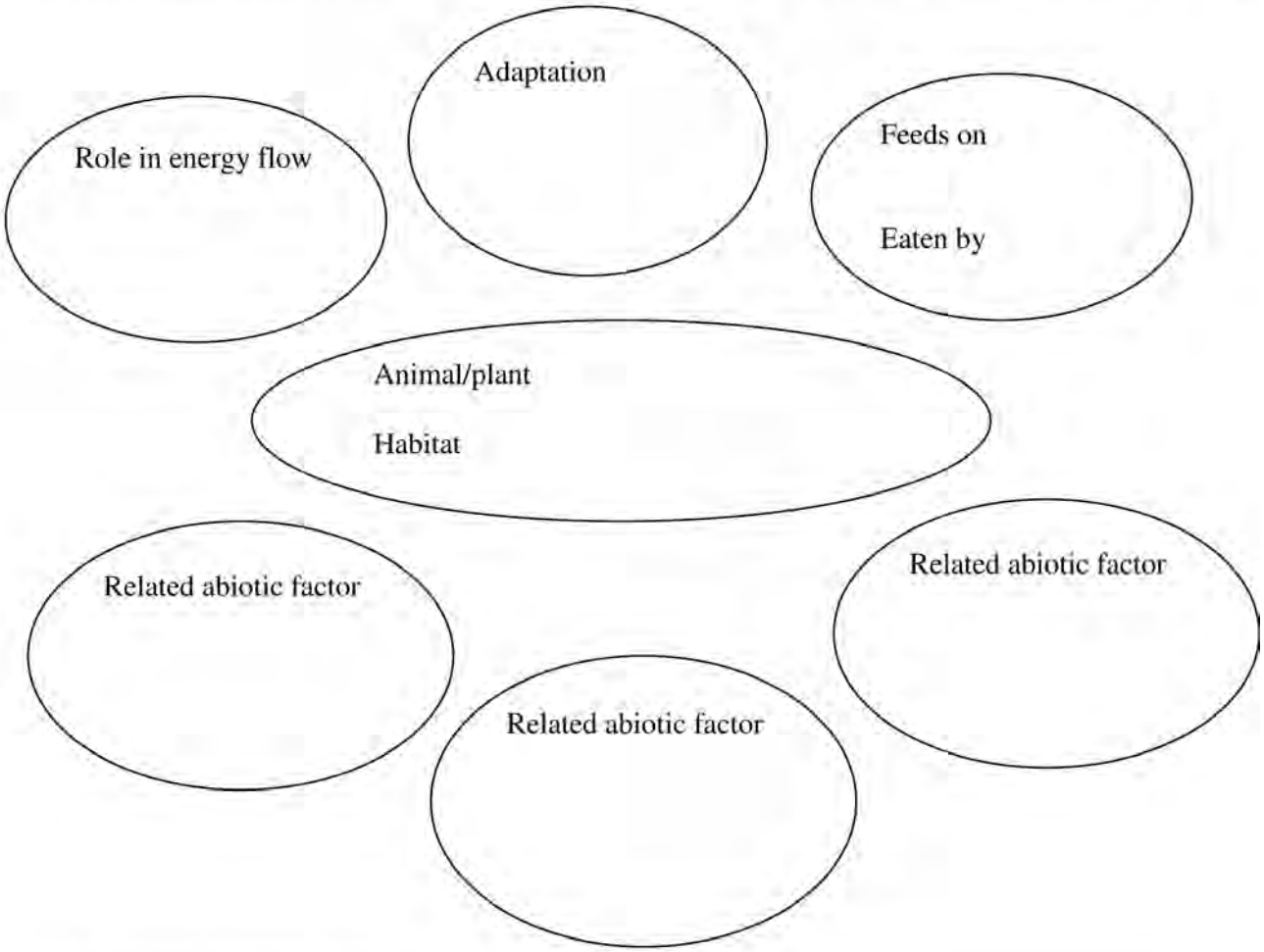

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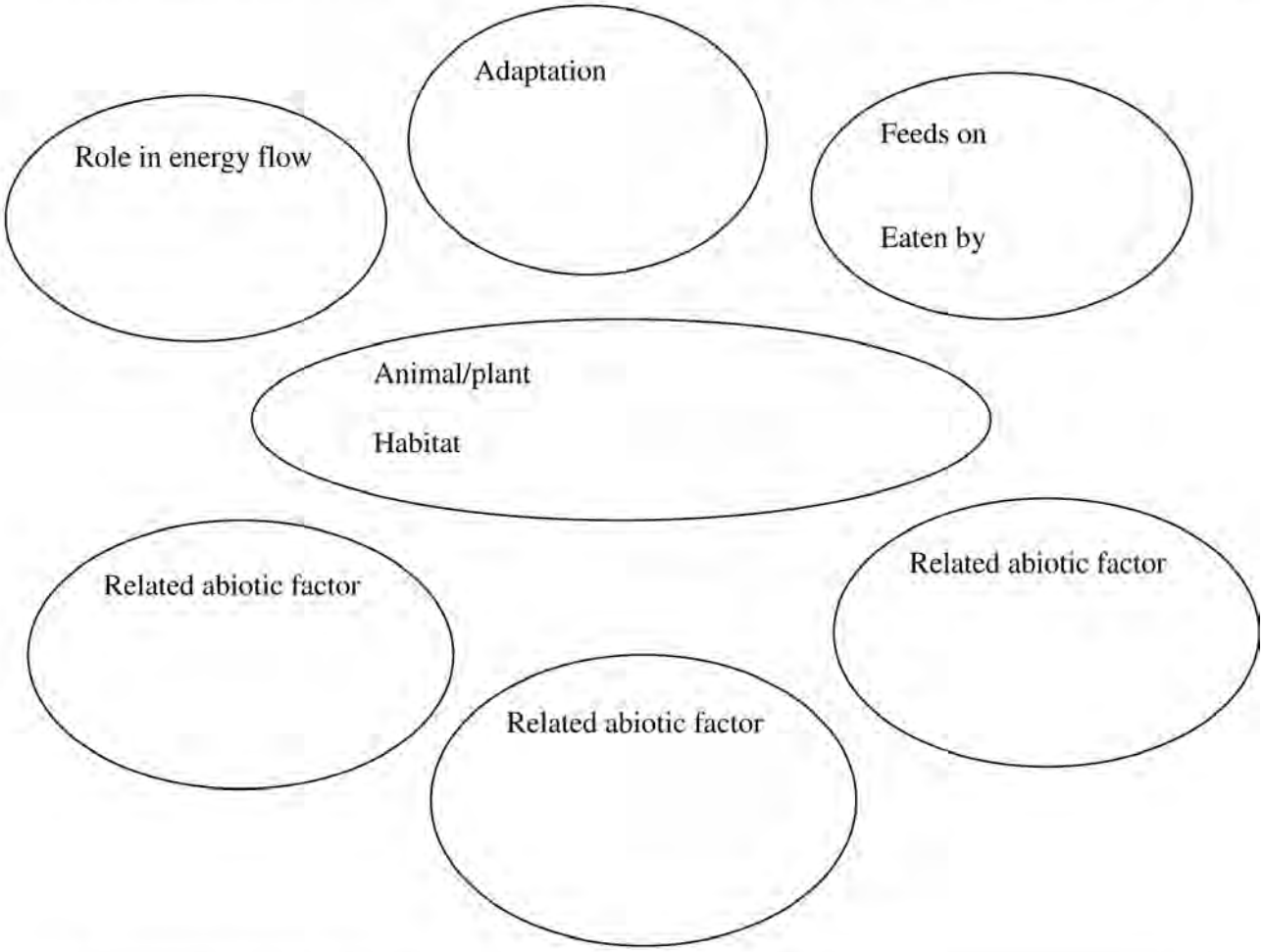

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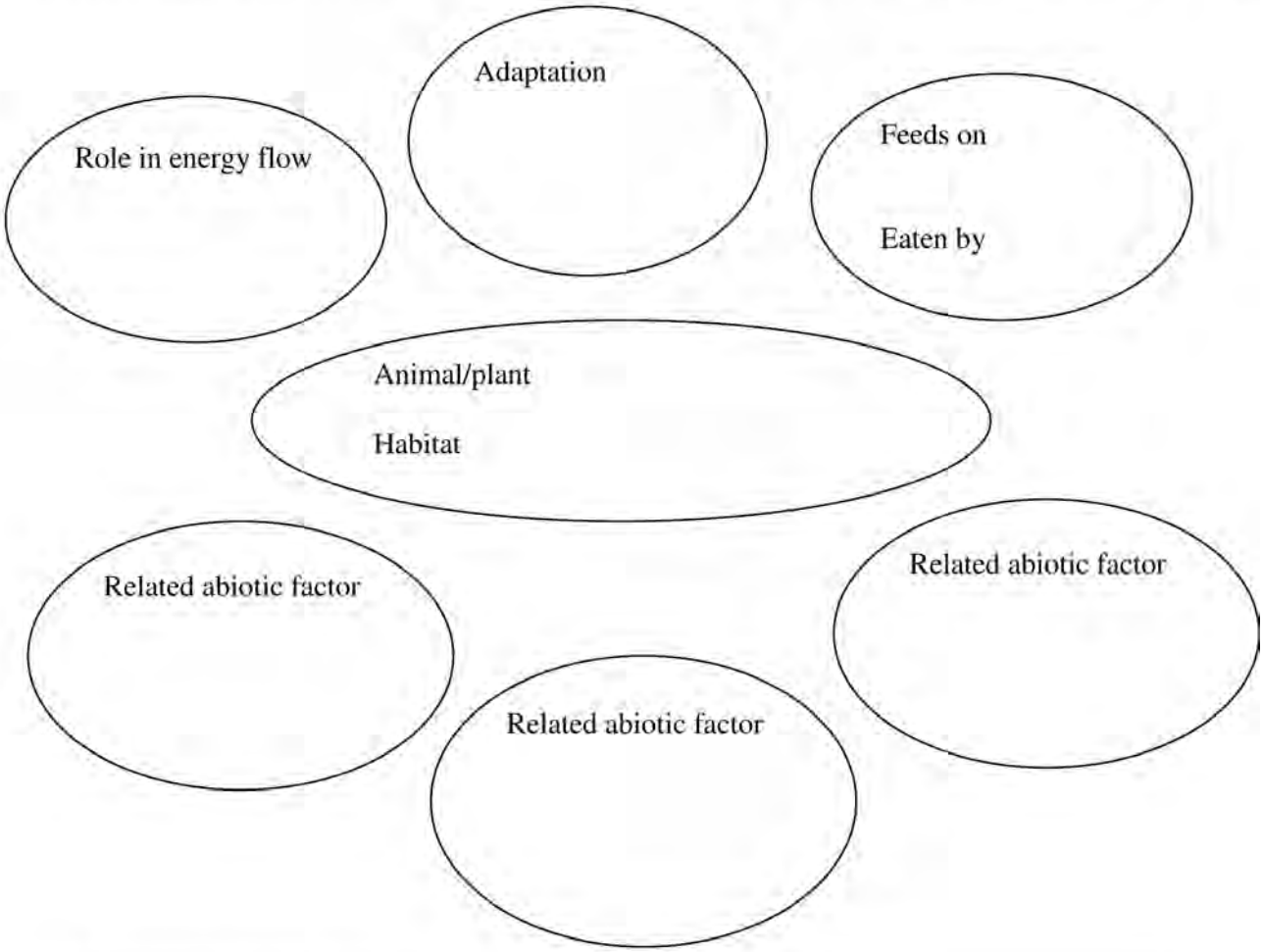

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