**Topic 4.1 Species, Communities, Ecosystems Skeleton Notes**

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|  | **Statement** | **Guidance** |
| 4.1.U1 | Species are groups of organisms that can potentially interbreed to produce fertile offspring. |  |
| 4.1.U2 | Members of a species may be reproductively isolated in separate populations. |  |
| 4.1.U3 | Species have either an autotrophic or heterotrophic method of nutrition (a few species have both methods). |  |
| 4.1.U4 | Consumers are heterotrophs that feed on living organisms by ingestion. |  |
| 4.1.U5 | Detritivores are heterotrophs that obtain organic nutrients from detritus by internal digestion. |  |
| 4.1.U6 | Saprotrophs are heterotrophs that obtain organic nutrients from dead organisms by external digestion. |  |
| 4.1.U7 | A community is formed by populations of different species living together and interacting with each other. |  |
| 4.1.U8 | A community forms an ecosystem by its interactions with the abiotic environment. |  |
| 4.1.U9 | Autotrophs obtain inorganic nutrients from the abiotic environment. |  |
| 4.1.U10 | The supply of inorganic nutrients is maintained by nutrient cycling. |  |
| 4.1.U11 | Ecosystems have the potential to be sustainable over long periods of time. |  |
| 4.1.S1 | Classifying species as autotrophs, consumers, detritivores or saprotrophs from a knowledge of their mode of nutrition. |  |
| 4.1.S2 | Setting up sealed mesocosms to try to establish sustainability.  (Practical 5) | Mesocosms can be set up in open tanks, but sealed glass vessels are preferable because entry and exit of matter can be prevented but light can enter and heat can leave. Aquatic systems are likely to be more successful than terrestrial ones. |
| 4.1.S3 | Testing for association between two species using the chi-squared test with data obtained by quadrat sampling. | To obtain data for the chi-squared test, an ecosystem should be chosen in which one or more factors affecting the distribution of the chosen species varies. Sampling should be based on random numbers. In each quadrat the presence or absence of the chosen species should be recorded. |
| 4.1.S4 | Recognizing and interpreting statistical significance. |  |

**Key Terms, Definitions and Examples**

|  |  |  |
| --- | --- | --- |
| **Key Term** | **Definition** | **Examples** |
| ecology |  |  |
| population |  |  |
| ecosystem |  |  |
| communities |  |  |
| species |  |  |
| habitat |  |  |

**Sketch the flowchart of Ecology**

**4.1.U1 Species are groups of organisms that can potentially interbreed to produce fertile offspring.**

1. Can species breed if they are not closely related?

2. What do you call an individual that is a product of interbreeding between two closely related species? What happens? Provide an example

**4.1.U2 Members of a species may be reproductively isolated in separate populations. AND 4.1.U7 A community is formed by populations of different species living together and interacting with each other.**

3. What happens when species are geographically separated?

4. Provide possible examples of geographical separation.

**4.3.U1 Autotrophs convert carbon dioxide into carbohydrates and other carbon compounds. AND 4.1.U9 Autotrophs obtain inorganic nutrients from the abiotic environment.**

5. Define autotroph:

6. What are some examples of inorganic compounds? Where are these obtained?

**4.1.U3 Species have either an autotrophic or heterotrophic method of nutrition (a few species have both methods).**

7. Why do all organisms require organic material? Provide some examples.

8. Compare autotrophs to heterotrophs.

**Nature of Science: Looking for patterns, trends and discrepancies - plants and algae are mostly autotrophic but some are not. (3.1)**

9. What is a mixotroph? Provide 2 examples.

**4.1.U4 Consumers are heterotrophs that feed on living organisms by ingestion.**

10. Heterotrophs that ingest other organisms obtain their organic molecules are known as **Consumers.** Complete the following table

|  |  |  |
| --- | --- | --- |
| **Type of Consumer** | **How does it obtain its organic molecule?** | **Example(s)** |
| Herbivore |  |  |
| Carnivore |  |  |
| Omnivore |  |  |
| Scavenger |  |  |

11. On a separate sheet, construct a freshwater food web based on the following information:

**Organism Energy sources**

Water crowfoot Sunlight

Cased caddisfly larva Micro-plants, algae, particles of dead plants and animals

Damselfly nymph Micro-plants, algae, particles of dead plants and animals

Mayfly nymph Micro-plants, algae, particles of dead plants and animals

Dragonfly Other adult insects and small flies

Duck A ll nymphs, all plants, snails, tadpoles, young frogs

Freshwater Shrimp Particles of dead plants and animals

Water vole Plants

Algae Sunlight

Otter Fish, frogs and newts

Water starwort Sunlight

Pond snail Microplants, all water plants and algae

Alderfly nymph Micro-plants, algae, particles of dead plants and animals

Pond skater Particles of dead plants and animals

Frog Mayfly, midge larvae, pond skater, caddisfly, small flies

Tadpole Micro-plants, algae

Micro-plants Sunlight

Great diving beetle Water flea, snails, tadpole, all nymphs

Bullhead fish Diving beetle, tadpole, all nymphs, water flea, snail, midge larvae

Adapted from: <http://www.cornwallriversproject.org.uk/education/education_pack.htm>

**4.1.U5 Detritivores are heterotrophs that obtain organic nutrients from detritus by internal digestion.**

**4.1.U6 Saprotrophs are heterotrophs that obtain organic nutrients from dead organisms by external digestion.**

|  |  |  |
| --- | --- | --- |
| **Type of Heterotroph** | **How does it obtain its organic molecule?** | **Example(s)** |
| Detrivores |  |  |
| Saprotrophs |  |  |

**Sample Questions:**

Question #1: Which group of organisms in the carbon cycle converts carbon into a form that is available to primary consumers?

1. Decomposers
2. Saprotrophs
3. Detritus feeders
4. Producers

Question #2: Slime moulds (*Acrasiomycota*) are protoctists. They feed on decaying organic matter, bacteria and protozoa. Which of the terms describes their nutrition?

I.Detritivore

II.Autotroph

III.Heterotroph

1. I only
2. I and II only
3. I and III only
4. I, II and III

**4.1.S3 Testing for association between two species using the chi-squared test with data obtained by quadrat sampling. AND 4.1.S4 Recognizing and interpreting statistical significance.**

11. Testing for associations between species because species may be associated in different ways.

|  |  |  |
| --- | --- | --- |
| **Positive Association** | **Negative Association** | **No Association** |
|  |  |  |
| Example: | Example: | Example: |

**HOMEWORK**

*Research 4 intertidal species (as indicated on the assignment outline). You will also need to determine the coordinates of your 10 quadrat spaces. This will help you prepare for our upcoming field trip.*

**Self Assessment:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Essential Biology** | | | **Assessment** | |
| **Criterion** | **Complete (2)** | **Partially complete (1)** | | **Self** | **MrT** |
| Presentation & Organisation | NA | File names sensible, work complete and well-presented. Filed in order of topic, and easy to access. All command terms highlighted or underlined. | |  |  |
| Academic Honesty | NA | Sources cited using the CSE (ISO 690 numerical) method, with Works Cited section complete and correct. | |  |  |
| **Objective 1** understanding | **All** answers for the following command terms correct: | Most answers for the following command terms correct: | |  |  |
| **Define Draw Label List Measure State** | | |
| **Objective 2** understanding | **All** answers for the following command terms correct: | | Most answers for the following command terms correct: |  |  |
| **Annotate Apply Calculate Describe Distinguish Estimate Identify Outline** | | |
| **Objective3**  understanding | **All** answers for the following command terms correct: | | Most answers for the following command terms correct: |  |  |
| **Analyse Comment Compare Construct Deduce Derive Design Determine Discuss**  **Evaluate Explain Predict Show Solve Sketch Suggest** | | |
| Logic, notation, mathematical working | NA | Answers are presented in a logical and concise manner. SI units used most times, with correct unit symbols and definitions of terms. All mathematical working shown. | |  |  |
| Further research | NA | Evidence is apparent of research and reading beyond the textbook and presentations to find correct answers to challenging questions. If any questions are unanswered, this criterion scores zero. | |  |  |
|  | **Total (max 10):** | | |  |  |