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## **4.1 Species, Communities, Ecosystems & Energy Flow**

Medium



# **BIOLOGY**

## **IB HL**

# 4.1 Species, Communities, Ecosystems & Energy Flow

## Question Paper

Course	DP IB Biology
Section	4. Ecology
Topic	4.1 Species, Communities, Ecosystems & Energy Flow
Difficulty	Medium

EXAM PAPERS PRACTICE

Time allowed: 20  
Score: /10  
Percentage: /100

**Question 1**

In a woodland habitat, blue tits and other small birds feed on various species of caterpillar and beetle, which themselves feed on the leaves of trees and herbaceous plants.

Which of the following statements accurately describes a population within this example?

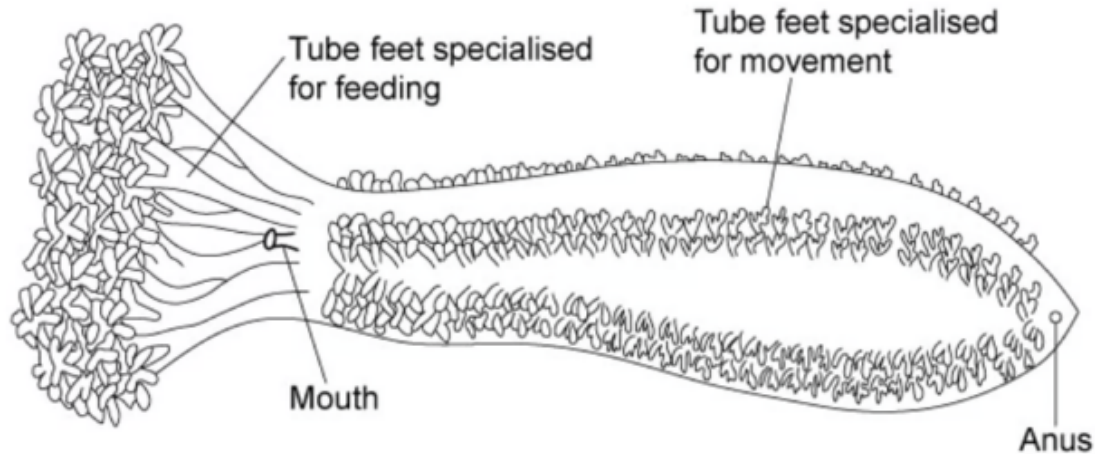
- A** All of the organisms living in the habitat, together with their living and non-living interactions.
- B** All of the small birds living in the habitat.
- C** All of the blue tits living in the habitat.
- D** All of the living organisms in the habitat.

[1 mark]



## Question 2

Sea cucumbers are heterotrophic marine organisms that feed on dead or waste material from the seafloor and surrounding water. They pick up and consume food particles using specialised tube feet that surround their mouths, as shown in the diagram below.



Which mode of nutrition and explanation is correct for sea cucumbers?

	Mode of nutrition	Explanation
<b>A</b>	Detritivore	They feed on dead and waste material and carry out external digestion
<b>B</b>	Detritivore	They feed on dead and waste material and carry out internal digestion
<b>C</b>	Saprotroph	They feed on dead and waste material and carry out internal digestion
<b>D</b>	Consumer	They feed on living organisms

[1 mark]



### Question 3

Which of the following statements about inorganic nutrients are correct?

- I. Living organisms gain all of their inorganic nutrients from the abiotic environment.
- II. Inorganic nutrients include simple compounds of carbon, hydrogen, oxygen, and nitrogen.
- III. Organisms need inorganic nutrients to build organic molecules.

- A I and II only
- B I and III only
- C II and III only
- D I, II, and III

[1 mark]

### Question 4

Why are ecosystems considered to be sustainable?

- A They do not require any outside input.
- B Nutrients such as nitrogen and carbon are constantly recycled.
- C Nutrients and energy are constantly recycled.
- D Nutrients are recycled and photosynthesis converts light energy into chemical energy.

[1 mark]



### Question 5

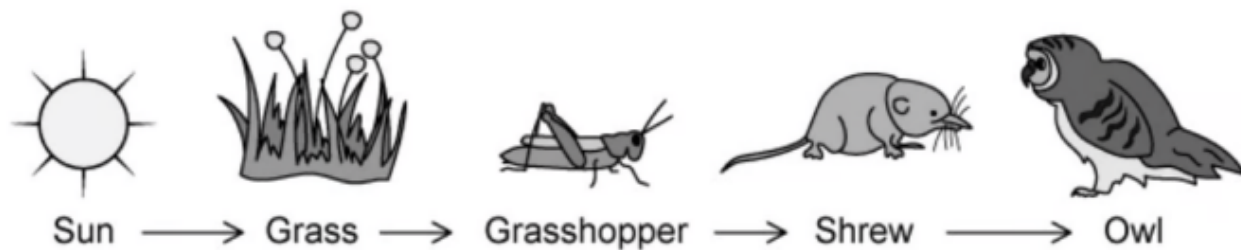
Which of the following statements is an example of a theory being used to explain a natural phenomenon?

- A** Energy loss at each trophic level causes the short length of food chains.
- B** Trophic levels contain less biomass as you go higher up the food chain.
- C** Energy is lost in the form of heat during the respiration reactions.
- D** There is an association between the distributions of limpets and dog whelks within a rocky shore habitat.

[1 mark]

### Question 6

The energy transferred from the sun to the grass in this food chain is  $65\,000\text{ kJ m}^{-2}\text{ year}^{-1}$ .



Approximately how much energy is passed from the shrew to the owl in  $\text{kJ m}^{-2}\text{ year}^{-1}$ ?

- A** 650 000
- B** 6 500
- C** 650
- D** 65



**Question 7**

Which of the following statements about quadrat sampling are true?

- I. Sampling must be random to avoid bias.
- II. Random samples can be achieved by closing your eyes and throwing a quadrat.
- III. Quadrat sampling is only useful for small organisms.

- A** I only
- B** I and II only
- C** I and III only
- D** I, II, and III

[1 mark]



### Question 8

A chi-squared test was carried out to test for association between species A and species B. The results of the chi-squared test are given below.

Results of chi-squared test:

Chi-squared value	5.89
Degrees of freedom	1

Critical values table:

Degrees of freedom	Probability level			
	0.1	0.05	0.01	0.001
1	2.71	3.84	6.64	10.83
2	4.60	5.99	9.21	13.82

What can be concluded from the chi-squared test for association carried out to test for association between species A and species B?

- A** There is no significant association between species A and species B
- B** Species A competes with species B for resources
- C** There is a statistically significant association between species A and species B at the 5% probability level
- D** There is a statistically significant association between species A and species B at the 1% probability level





Question 9

Which of the following considerations should be taken into account when building a mesocosm to test the impact of a particular environmental variable?

<b>A</b>	Any type of container can be used	No secondary consumers	Inclusion of autotrophs	Producers should be slow-growing
<b>B</b>	Transparent container	Food chains of up to three organisms can be included	Inclusion of autotrophs	Producers should be slow-growing
<b>C</b>	Transparent container	No secondary consumers	Inclusion of autotrophs	A control mesocosm should be built
<b>D</b>	Transparent container	No secondary consumers	Inclusion of autotrophs	Soil should be sterilised to prevent contamination

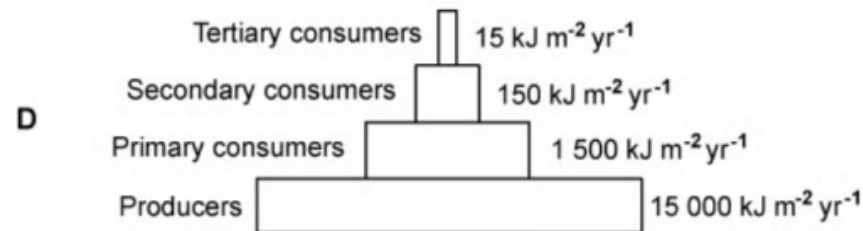
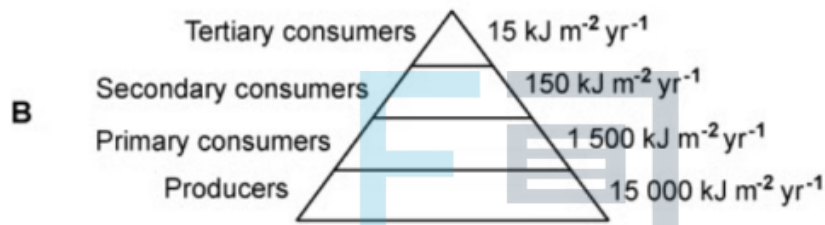
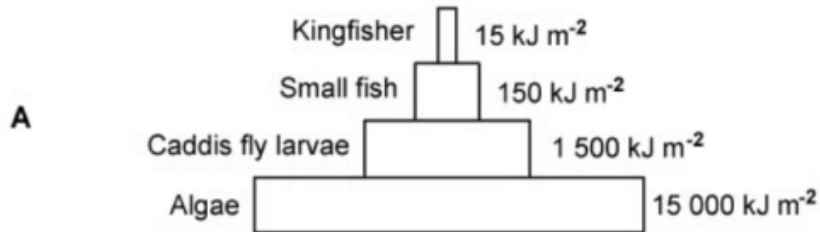
[1 mark]



Question 10

Which pyramid of energy correctly represents the food chain shown?

Algae → caddis fly larvae → small fish → kingfisher



[1 mark]