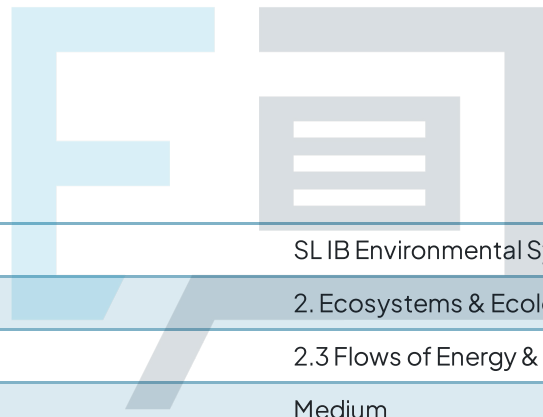




2.3 Flows of Energy & Matter

Question Paper



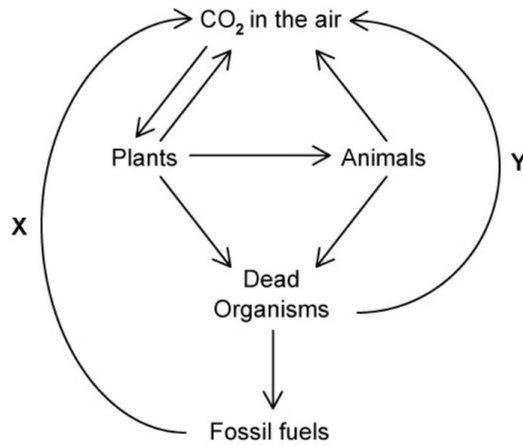
Course	SL IB Environmental Systems & Societies (ESS)
Section	2. Ecosystems & Ecology
Topic	2.3 Flows of Energy & Matter
Difficulty	Medium

Exam Papers Practice

To be used by all students preparing for
SL IB Environmental Systems & Societies (ESS)
Students of other boards may also find this useful

Question 1a

Part of the carbon cycle is shown in the diagram below.



i) Identify processes **X** and **Y** in the diagram.

[2]

ii) Describe how carbon is released during process **Y**.

[3]

[5 marks]

Question 1b

Carbon from fossil fuels enters the atmosphere during combustion.

i)

Explain how this process contributes to rising average global temperatures.

[2]

ii)

Cutting down trees during deforestation increases the problem described in part i).

Explain how.

[2]

[4 marks]



Question 2a

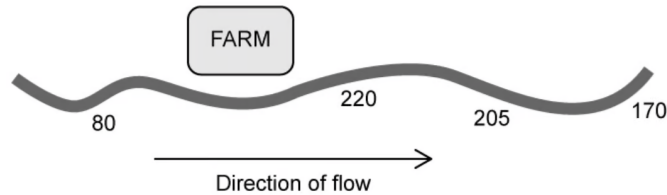
Describe the role of bacteria in the nitrogen cycle.

Exam Papers Practice

[5 marks]

Question 2b

The figure below shows a diagram of a stream that runs past a farm. A group of students took water samples at various locations along the stream and measured the nitrate concentration in parts per million (ppm) in those water samples. The students have marked these nitrate concentrations on their diagram.



Explain how the farm may be causing the increase in nitrate concentration in the water

[2 marks]

Question 3a

Define the term *gross primary productivity*.

[2 marks]

Exam Papers Practice

Question 3b

Only around 1% of the light energy that reaches the Earth's atmosphere is captured by plants and made available to other organisms in the food chain.

Suggest reasons for this low value.

[4 marks]

Question 4a

Woodlice are detritivorous insects (they feed on the dead remains of plants). A biologist estimated the numbers of woodlice at two different sites in a woodland ecosystem. They also estimated the net primary production of the sites to see if this influenced the numbers of woodlice present. Their results are shown in the table below.

Site	Number of woodlice per m ²	Net primary productivity / g m ⁻² y ⁻¹
X	240	1320
Y	80	460

Although net primary production is a measure of plant biomass formed per year, it does not represent the total amount of plant biomass formed per year by photosynthesis.

i)
Explain why.

[1]

ii)
Explain why there is a greater number of woodlice in site X than site Y

[1]

This woodland ecosystem has a total average gross primary productivity of 20 000 kJ m⁻² y⁻¹ but the net primary productivity is calculated to be 12 000 kJ m⁻² y⁻¹.

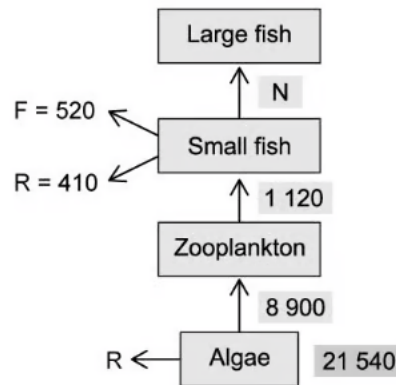
iii)
Calculate how much energy one square metre of this grass loses as heat from respiration in one year.

[1]

[3 marks]

Question 4b

The figure below shows the energy transfers taking place in a simple food chain. The energy values are all given in $\text{kJ m}^{-3} \text{y}^{-1}$.



= Gross productivity
 = Net productivity / energy ingested

The efficiency of energy transfer can be calculated using the following equation:

$$\text{Ecological efficiency} = (\text{energy used for new biomass} \div \text{energy supplied}) \times 100$$

Use information in the figure and the equation provided to calculate the efficiency of energy transfer for zooplankton.

[2 marks]