

Name: \_\_\_\_\_

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Class: \_\_\_\_\_

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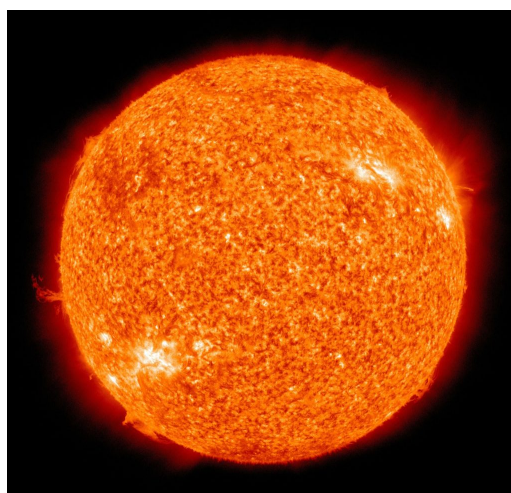
**IB ESS**

# 2.3 Flows of Energy and Matter

## Significant ideas:

Ecosystems are linked together by energy and matter flows.

The Sun's energy drives these flows and humans are impacting the flows of energy and matter both locally and globally.



## Energy Transfers

1. Draw a diagram to summarise the transfers and transformations of solar energy that occur as it reaches the Earth. Use the details listed below:

3% reflection by scatter	17% absorption by molecules/dust
19% reflection by clouds	3% absorption by clouds
9% reflection by ground	49% absorption by the ground

2. Roughly what percentage of the Sun's radiation is available to plants for photosynthesis?

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3. Draw a systems diagram to summarise the pathways of energy through an ecosystem.



# Productivity

1. The sentences below each describe one of the phrases in the box. Write the correct phrase below each sentence.

**Net primary productivity**      **Gross primary productivity**  
**Net secondary productivity**      **Gross secondary productivity**  
**Maximum sustainable yield**

The total amount of stuff (energy or biomass) that's taken in and assimilated by a consumer. An example is all the food that an animal takes in, subtracting what it releases as faeces.

The total amount of energy/matter assimilated by a producer (e.g. a plant), before it gets used by the plant for respiration.

The food that an animal consumes, with fecal losses AND respiration subtracted. This is basically what is available to the next trophic level.

The amount of energy/biomass that a producer takes in that it actually keeps (and doesn't use for respiration).

This is equivalent to NPP or NSP (depending on the context). It's basically the amount of "useful" stuff that is produced by a system.

2. Complete the table below summarizing the details of productivity:

Productivity type	Abbr.	Calculation	Units
Net primary productivity			
		Food eaten – fecal loss	
	NSP		



# The Carbon Cycle

- 1.
- a) Complete the table to list the flows and storages in the carbon cycle.

Storages	Flows

- b) Draw a systems diagram to represent the carbon cycle. Include all storages and flows.



# The Nitrogen Cycle

1.

a) Complete the table to list the flows and storages in the nitrogen cycle.

Storages	Flows

b) Draw a systems diagram to represent the nitrogen cycle. Include all storages and flows.



# Human Impacts

1. Outline ways in which humans influence **energy** flows.

*Hints:*

- Greenhouse gases
- Increased water vapour (clouds are reflective)
- Deforestation
- CFCs, ozone and UV light
- Agriculture: disrupting the natural flow through a food chain/web
- ... (any others you can think of?)

2. Explain the impact of the industrial revolution on the **carbon** cycle.



3. Outline the ways in which the agriculture industry has influenced the **nitrogen** cycle.

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