Name: _____

Date: _____

Class: _____

IB ESS

5.1 Introduction to Soil Systems

Significant ideas:

The soil system is a dynamic ecosystem that has inputs, outputs, storages and flows.

The quality of soil influences the primary productivity of an area.

The Soil Profile

1. Label the diagram below with the following parts. Include a brief description of each horizon.

The Soil "System"

1. Read the description of the soil system below. Using coloured pens/highlighters, label all of the inputs, outputs, storages and flows. Don't forget to complete the key.

Soil is made of many materials. Material such as leaf litter enters the soil and contributes to the organic matter. Inorganic material such as minerals move through the soil with water if they are dissolved. They enter from the bedrock below. Water can enter or leave as rainfall or through evaporation, and this can influence the direction of movement of minerals. Soil is generally porous (though some soils more so than others). This means that air is usually able to diffuse into the soil.

There is biomass in the form of living organisms, which transfer throughout the soil as they are mobile, and can help move materials around within the soil. This is known as biological mixing. Material may also be moved through the system by non-living things; rainwater can carry suspended material to different places. This is known as translocation.

Within the soil there is the break down of organic matter by decomposers in the process of decomposition. There is also a natural process of nutrient cycling, which often involves living organisms. The nitrogen cycle is a good example of the complex series of transformations that nutrients might go through. Not all transformations within the soil require living organisms, however. For example, chemical weathering will change materials into different forms.

Plants take material from the soil; photosynthesis requires the uptake of water by roots. Furthermore, plants need a range of minerals to form biological compounds, and these minerals are also supplied by uptake through roots.

Lastly, material may leave the system through soil erosion. This can happen because of surface run-off, and may be influenced by a reduction in natural plant life as roots tend to stabilize soil.

KEY:

3. Draw a systems diagram to represent a soil system. When you label each flow, state whether it is a transfer or a transformation.

4. Merriam-Webster dictionary defines *Ecosystem* as:

> "The complex of a community of organisms and its environment functioning as an ecological unit."

Explain why the soil system can be viewed as an ecosystem.

Soil Texture

1. The mineral content of soil varies amongst different soil types. However, mineral particles can be broadly categorized based on their size.

a) Complete the table below to show the type and associated size of the three types of soil particle.

Particle Type	Particle size (mm)
1.	
2.	
3.	

b) Briefly outline the properties of soils composed of the particle types listed above:

Type 1

Type 2

Type 3

2. Soils are unlikely to be composed of one particle type only, but a combination of each. The relative amounts of each particle dictate the type of soil (and its properties).

Use a soil texture triangle to identify the type of soil with the following particle compositions.

You will find a soil texture diagram in your textbook, or you can do an online search.

Particle Composition (%)			**Soil type**
Clay	**Silt**	**Sand**	
50	50	0	
30	30	40	
20	40	40	
60	20	20	

3. Describe how you could test for particle composition of soil using the following methods:

Sieves

The jar method

4. **Describe** and **explain** the relative fertility of clay soil, sandy soil and loam (loam includes a mixture of soil particles).

HELP: You will know you've provided enough information if you state the fertility levels of each soil type, and discussed the water holding capacity, drainage, porosity, mineral content, and potential to hold organic matter in each type, and linked these factors to the primary productivity of the soil.