

## Sample Lesson Plan – Science

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**Year/Stage:** Year 9/Stage 5

**Teacher:**

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### Syllabus reference

Knowledge and Understanding: *Living World*

Content:

*LW2 Conserving and maintaining the quality and sustainability of the environment requires scientific understanding of interactions within, the cycling of matter and the flow of energy through ecosystems.*

*(a) recall that ecosystems consist of communities of interdependent organisms and abiotic components of the environment*

*(c) describe how energy flows through ecosystems, including input and output through food webs*

Outcomes:

*SC5-14LW analyses interactions between components and processes within biological systems*

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**Text:** *Oxford Big Ideas Australian Curriculum Science 9, Oxford, Chapter 4, pp 96–99*

S Cash, G Quinton, C Tilley (2012)

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**Language focus:** *Classifying and describing, definitions, technical terms in biological sciences*

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### Preparing for reading (Stage 1)

**Background knowledge:** (from previous learning)

- *energy and matter, types of energy, flow of energy*
- *organisms, kingdoms, ecosystems, biotic and abiotic, food chains, bacteria, prokaryotic*
- *photosynthesis, sugars, proteins, cellulose*
- *chemical reactions, oxygen, carbon dioxide, nitrogen, phosphorus*
- *Earth's crust, energy from Sun, atmosphere, evaporation, condensation, precipitation*

**Summary of the text:** (dot-point for each section)

- *Define energy (ability to do work) and matter (building blocks of everything).*
  - *How energy moves through an ecosystem, and matter is recycled.*
  - *Plants use solar energy for photosynthesis, animals get energy from plants.*
  - *Sugars contain energy, organisms transform energy into other forms to do work.*
  - *Matter flows through ecosystems as food and waste.*
  - *Water cycle transfers water through evaporation, condensation and precipitation.*
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### Detailed reading (Stage 2)

Read each paragraph, discuss and have students mark key information. In this sample lesson plan, the information to mark is highlighted in the accompanying copy of the text.

Detailed reading may be performed on part of the text and/or may be set for students to complete individually or in groups.

**Note:** Discuss the illustrations that accompany the text as it is read.

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### **Note-making from the text (Stage 3)**

Students use their marked or highlighted key information to make notes. One student may write the notes on the board as others dictate.

This might be a whole-class activity or it could start with the whole class and then be completed individually or in groups, depending on the needs of the class and the time available.

The following are examples of notes from the information highlighted on the accompanying text:

#### ***Ecosystems***

- *producers, herbivores, carnivores and decomposers*
- *non-living (abiotic) factors also interdependent*
- *energy and matter flows in cycles because of interactions within ecosystems*
- *dynamic interactive unit*

#### ***Energy and matter***

- *energy is ability to do work – transferred*
- *matter is building blocks of everything – recycled*

#### ***Flow of energy***

- *first source of energy – solar energy via photosynthesis*
- *animals obtain energy from plants and other animals*
- *energy flows in only one direction – not recycled*
- *continuously take in more energy from the sun*

#### ***Energy for work***

- *sugars contain energy – must convert into other forms*
- *energy transformations – metabolic processes*
- *building compounds – build and replicate molecules*
- *communication – within and between cells*
- *physical movement – muscles or movement towards sunlight (plants)*
- *transport – move substances – nutrients and wastes – organism's body – into and out of cells*

#### ***Flow of matter***

- *plants absorb simple substances – carbon dioxide, water, minerals*
- *converted into sugars by photosynthesis*
- *other compounds from the sugars*
- *broken down by decomposers*
- *reused by plants*

#### ***Cycles of matter***

- *atmosphere or earth's crust – biogeochemical cycle*

#### ***Water cycle***

- *driven by heat from sun*
- *precipitation – evaporation – transpiration from plants*
- *water moved between land, oceans, atmosphere*

#### ***Carbon cycle***

- *carbon is in carbon dioxide, sugars, proteins, lipids*
- *carbon dioxide*
  - *returns through respiration, burning fossil fuel, forest fires, decomposition*
  - *removed in photosynthesis*

#### ***Nitrogen cycle***

- *nitrogen:*
  - *gas in atmosphere*

- organic nitrogen, eg ammonia, amino acids, proteins, nucleic acids, in living things
- micro-organisms convert nitrogen from air
- denitrifying bacteria return nitrate to atmosphere

#### **Oxygen cycle**

- oxygen originally produced by cyanobacteria—prokaryotic autotrophic organisms
- plants came later and also contribute oxygen
- respire – aerobically or anaerobically
- balance of oxygen: production – photosynthesis, use – aerobic respiration

#### **Phosphorus cycle**

- essential compounds for living organisms – phosphorus, potassium, calcium
- plants absorb from soil
- dead matter broken down to minerals

Note-making may be performed on part of the text and/or may be set for students to complete individually or in groups.

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#### **Joint construction from notes (Stage 4)**

This is an example of a text that could be written from the notes in Stage 3.

*Ecosystems are dynamic interactive units. Energy and matter flow in cycles between abiotic factors such as the atmosphere and soil, and biotic factors, including producers, herbivores, carnivores and decomposers. Energy is the ability to do work and is transferred in ecosystems. Matter is the building blocks of all things and is recycled in ecosystems.*

*The Sun is the origin of energy in ecosystems. Energy is not recycled but flows in only one direction, from the Sun through organisms. Plants and other producers absorb the Sun's energy through photosynthesis. Herbivores consume energy from producers, and carnivores consume energy from herbivores.*

*Energy is transformed into sugars by producers, and is then transformed into other forms for organisms to use in their metabolic processes. These processes include (1) building and replicating molecules, (2) communicating within and between cells, (3) movement of muscles in animals and towards sunlight in plants, and (4) transport of substances, such as nutrients and wastes, around an organism's body and into and out of cells.*

*Matter is cycled between the atmosphere or earth's crust (abiotic) and organisms (biotic). This is called the biogeochemical cycle. Matter is absorbed by plants as simple substances like carbon dioxide, water and minerals, and converted into sugars by photosynthesis. Other compounds are then made from the sugars. These compounds are later broken down by decomposers, and reused by plants. Matter cycles include the water cycle, carbon cycle, nitrogen cycle and phosphorus cycle.*

*In the water cycle, water is evaporated from the oceans and land by the Sun's heat, and transpired from plants. It then precipitates back to the land and oceans as rain, snow or ice.*

*(continued)*

Joint construction may be performed on part of the text and/or may be set for students to complete individually or in groups.