STUDY GUIDE CHAPTER 8 - ANSWERS

1) ***THE CARBON CYCLE - Describe the transformations related to the circulation of carbon.***

DEFINITION: the carbon cycle is a set of processes by which the essential element CARBON passes from one environment to the next and returns to its original environment, in an infinite loop of recycling.

Transformations involving the circulation of carbon ON LAND:

ATMOSPHERE

CAPTURE *(removing of CO_2 from the atmosphere)*	***RELEASE*** *(returning of CO_2 to the atmosphere)*
PHOTOSYNTHESIS: *plants capture carbon dioxide and transform it into glucose;*	***RESPIRATION:*** *living organisms return the carbon they have ingested to the atmosphere;*
- *herbivores or carnivores eat plants or other animals to take in the carbon they need;*	***DECOMPOSITION*** *of dead plants and animals and waste;*
	FOREST FIRES: *release large amounts of carbon dioxide into the atmosphere;*
	VOLCANIC ERUPTIONS *release large amounts of carbon dioxide in atmosphere;*

Transformations involving the circulation of carbon IN SEAS AND OCEANS:

ATMOSPHERE

CAPTURE *(removing of CO_2 from the atmosphere)*	***RELEASE*** *(returning of CO_2 to the atmosphere)*
CALCIUM CARBONATE SYNTHESIS: *part of the carbon dioxide present in the atmosphere and in rocks is dissolved in the water of seas and oceans becomes calcium carbonate; marine organisms absorb the calcium carbonate and form their shells and skeletons; the calcium carbonate from shells and skeletons falls to the ocean floor where it is changed and gradually forms carbonate rock*	*At the surface, carbonate rock can release part of the carbon it contains by melting on contact with magma during volcanic eruptions;*
- *dead organisms fall to the bottom of the oceans and are buried in the sediment; the carbon they contain sometimes change into fossil fuels; this process takes millions of years*	***COMBUSTION OF FOSSIL FUELS*** *releases large amounts of carbon dioxide into the atmosphere*

SAMPLE PROBLEMS

2. List the processes of the carbon cycle that are illustrated in the photos below:

Examples:

- **CALCIUM CARBONATE SYNTHESIS (THE MANUFACTURE OF CALCIUM CARBONATE BY MARINE ORGANISMS LIKE SHELLS AND SKELETONS);**
- **PHOTOSYNTHESIS IN PLANTS;**
- **CARBON DIOXIDE (CO_2) EMISSION BY CARS (FROM FOSSIL FUEL COMBUSTION);**
- **CARBON DIOXIDE (CO_2) EMISSION BY A FOREST FIRE (COMBUSTION);**
- **CARBON DIOXIDE (CO_2) EMISSION BY RESPIRATION IN PLANTS AND HUMANS;**

3. Carbon dioxide (CO_2) is an important source of carbon for living organisms.

a) Through which two processes does carbon enter the biosphere?

- **PHOTOSYNTHESIS**
- **CALCIUM CARBONATE SYNTHESIS (THE TRANSFORMATION OF CO_2 DISSOLVED IN WATER INTO CALCIUM CARBONATE -SHELLS AND SKELETONS OF MARINE ORGANISMS)**

b) The carbon absorbed by human beings usually ends up returning to the atmosphere as CO_2. Briefly describe the two processes involved in this transfer.

HUMAN BEINGS EXHALE CO_2 IN THE PROCESS OF RESPIRATION. MEANWHILE, THE DECOMPOSITION OF HUMAN WASTE AND REMAINS ALSO EMITS CO_2 INTO THE ATMOSPHERE.

2) DYNAMICS OF ECOSYSTEMS – BIODIVERSITY: *Define the biodiversity of a community and explains factors that affect the biodiversity.*

DEFINITION: biodiversity describes the variety of species living in a community.

FACTORS THAT AFFECT THE BIODIVERSITY:

1) the number of species in the community(species richness);

2) the relative abundance of each species(the number of individuals in a certain species in relation to the total number of individuals in the community (ex. the relative abundance of species A is 20%... meaning species A makes up 20% of the individuals in a community).

SAMPLE PROBLEMS

1. The Amazon Rainforest, in South America, is considered the most diverse forest habitat on Earth. ***What criteria do scientists use to establish the degree of biodiversity in a community?***

   1) THE NUMBER OF SPECIES IN THE COMMUNITY (ITS SPECIES RICHNESS)

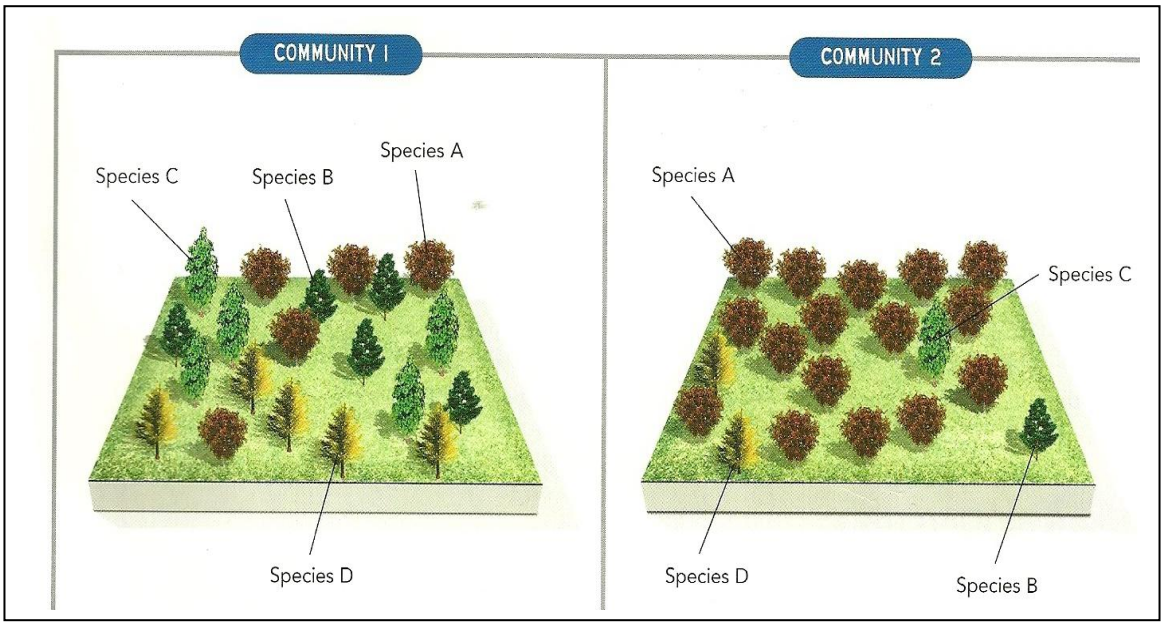
   2) THE RELATIVE ABUNDANCE OF EACH SPECIES IN THE COMMUNITY

2. What is the relative abundance (as a percentage) of the species (underlined words) in question?

1. in an aquarium, there are 16 fish, including 4 goldfish. **4÷16= 0.25 25%**

2. In a park there are 22 trees, including 6 pine trees. . **6÷22= 0.27 27%**

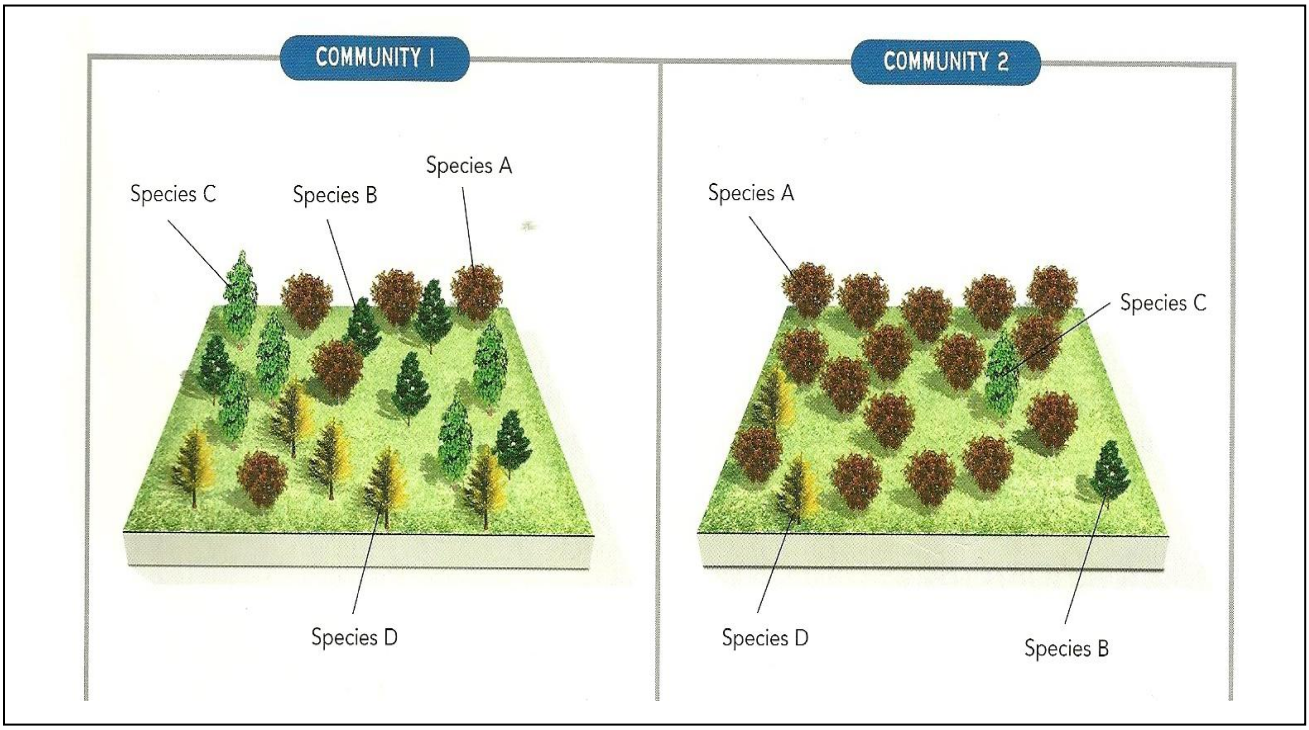
3. The picture below represents two different forests:



a) Compare the species richness of the two forests:

THERE ARE FOUR SPECIES IN EACH FOREST. CONSEQUENTLY, THEIR SPECIES RICHNESS IS THE SAME.

b) Find the relative abundance of each of the species in the two forests.



Community 1 (20 trees)	Community 2(20 trees)
Species A . 5÷20= 0.25 25%	***Species A . 16÷20= 0.80 80%***
Species B. 5÷20= 0.25 25%	***Species B 1÷20= 0.05 5%***
Species C. 5÷20= 0.25 25%	***Species C 1÷20= 0.05 5%***
Species D. 5÷20= 0.25 25%	***Species D 2÷20= 0.1 10%***

C) Which forest has the greater biodiversity?

COMMUNITY 1 BECAUSE THE RELATIVE ABUNDANCE OF EACH SPECIES IS SIMILAR.

4. ***TROPHIC RELATIONSHIPS:*** ***Describe the trophic levels (producers, consumers, decomposers). Explain the relationships between the trophic levels of a food web.***

TROPHIC RELATIONSHIPS: *feeding connections among the living organism in an ecosystem.*

PRODUCERS: *autotrophic organisms that have the ability to create organic matter from inorganic matter. They introduce the energy of the sun into ecosystems.*

CONSUMERS: *heterotrophic organisms that feed on other living organisms.*

DECOMPOSERS: *organisms that feed on the waste and remains os other living organisms; they recycle the matter in an ecosystem. They break down organic matter into inorganic matter, which then becomes available to producers.*

SAMPLE PROBLEMS

1. ***What is the main source of energy in an ecosystem?***_____
THE SUN

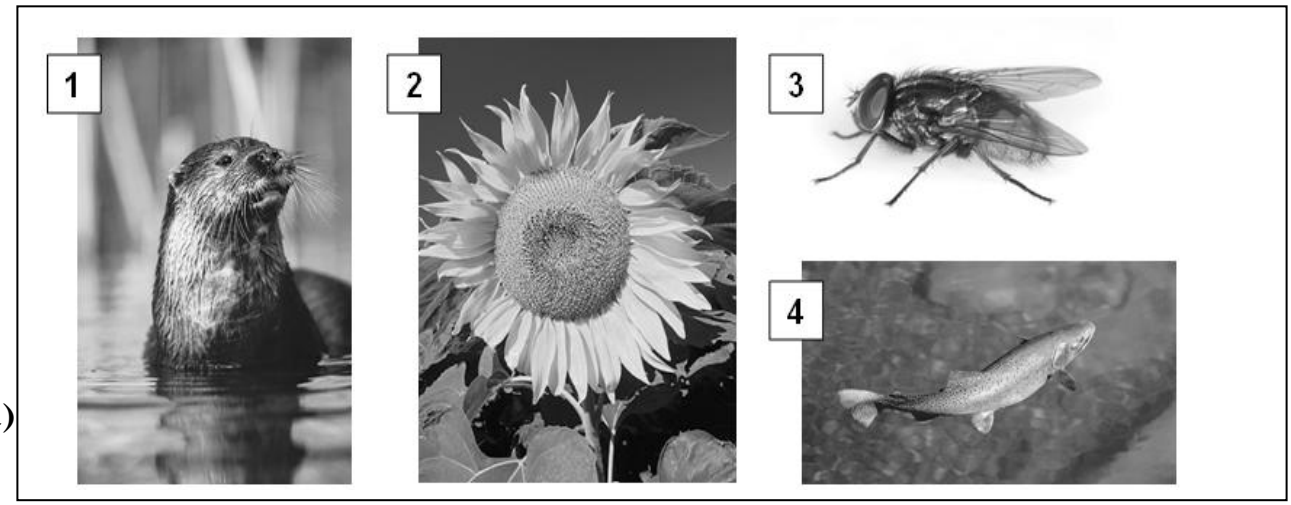
2. A carnivore cannot be a primary consumer in a food chain. ***Explain your answer.***
BECAUSE PRIMARY CONSUMERS FEED ON PLANTS OR PARTS OF PLANTS. CARNIVORES FEED ON OTHER ANIMALS, NOT ON PLANTS, SO THEY CANNOT BE PRIMARY CONSUMERS.

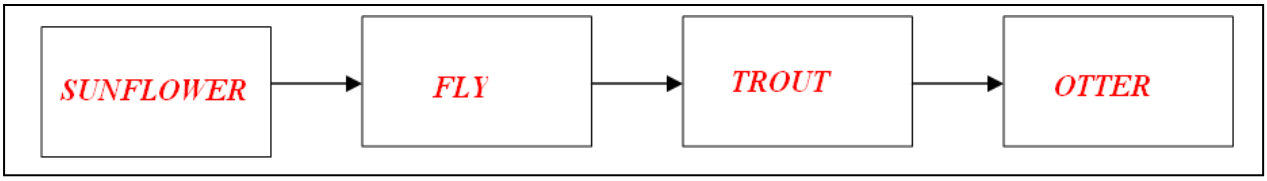
3 Which trophic level do detritivores belong to? ***Explain your answer.***
DETRITIVORES BELONG TO THE TROPHIC LEVEL OF DECOMPOSERS BECAUSE THEY FEED ON THE WASTE OF LIVING ORGANISMS AND ON DEAD MATTER.

4. ***What is transferred from one organism to another within each ecosystem?***
MATTER AND ENERGY

6. ***Build a food chain based on the photos below:***

a)

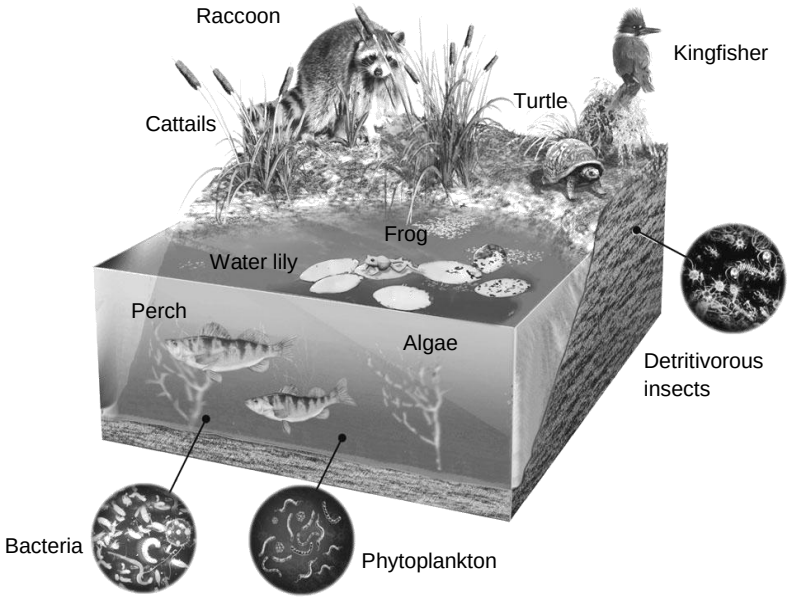




b) Specify the trophic level for each of the living organisms in your food chain.

THE SUNFLOWER IS A PRODUCER. THE FLY, TROUT AND OTTER ARE ALL CONSUMERS.

7. Look at the illustration below.



a) Among the organisms in the illustration, name those that are:

a. **PRODUCERS**: **CATTAILS, WATER LILY, ALGAE AND PHYTOPLANKTON**

b.CONSUMERS: RACCOON, KINGFISHER, FROG, TURTLE AND PERCH

c. ***DECOMPOSERS:*** **DETRITIVOROUS INSECTS AND BACTERIA**

b)Draw a possible food chain containing the organisms in the illustration.

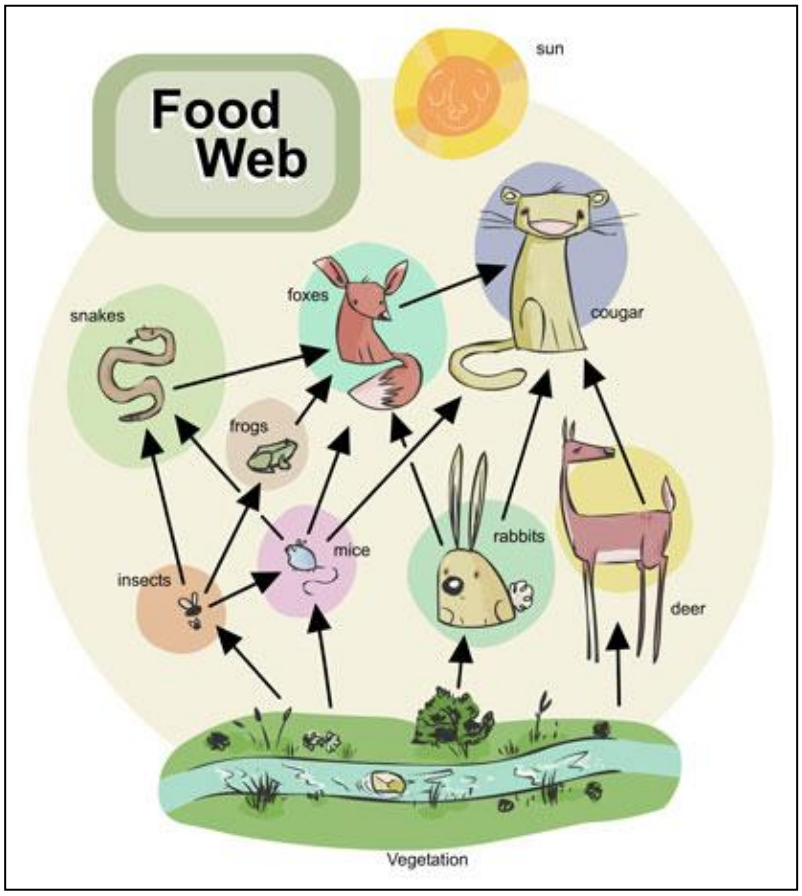
EXAMPLE: CATTAILS → TURTLE → RACCOON

ALGAE →PERCH →KINGFISHER

8. If you tried to establish the feeding relationships between all the organisms of the lake ecosystem illustrated in question 12, ***would you be drawing a food chain or a trophic network***? Explain your answer.

I WOULD BE DRAWING A TROPHIC NETWORK BECAUSE I WOULD BE REPRESENTING SEVERAL FOOD CHAINS IN THE SAME HABITAT.

9. The diagram below shows a simple food web:



a) Which organism(s) are the producer(s)? ***THE VEGETATION***

b) Which organism(s) are primary consumer(s)? ***INSECTS, MOUSE, RABBIT, DEAR***

c) Which organism(s) are secondary consumer(s)? ***SNAKE, FOX, COUGAR***

d) Which organism(s) are tertiarty consumer(s)? ***THE FOX***

e) Which organism(s) are 4th level consumers? ***THE COUGAR***

f) Which organism(s) are herbivores? ***INSECTS, MOUSE, RABBIT, DEAR***

g) Which organism(s) are omnivores? ***THE MICE***

h) Which organism(s) are carnivores? ***SNAKE, FOX, COUGAR***

4) DISTURBANCES: ***Define a disturbance in a community. Explain the effects of certain factors that disturb the ecological balance.***

DEFINITION: a disturbance is *an event that damages an ecosystem; any changes in an ecosystem affect its fauna and flora..*
A disturbance could: - lead to the disappearance of species
- alter the availability of resources.

TYPES OF DISTURBANCES

NATURAL DISTURBANCES - *they are triggered by environmental phenomena rather than by humans but they damage ecosystems nonetheless. Their effects can be felt even at the bottom of the ocean for example hurricanes, ice storms, sand storms, forest fire of natural origin etc.*
They vary in: - ***frequency (****ex: the occasional springtime flooding of some rivers)*
- ***severity*** *(ex: ice storms that can last a few hours or even several days)*

HUMAN DISTURBANCES *- human activities that have a damaging effect on ecosystems. Produced by the constant increase in the expoitation of resources, these activities and their consequences disrupt the natural balance of ecosystems. For example logging operations, oil spills or mining.*

ECOLOGICAL SUCCESSION - *After a disturbance, an ecosystem undergoes a series of changes that lead to the restoration of the natural balance the ecosystem that has been affected by a disturbance. Sometimes these changes are spread out over hundreds of years.*

SAMPLE PROBLEMS

1. True or false? Explain your answers.

a) The freezing of a lake can be considered a natural disturbance.
TRUE. THIS DISTURBANCE IS NOT CAUSED BY HUMANS.

b) Excessive hunting and fishing are human disturbances of ecosystems.
TRUE. EXCESSIVE HUNTING AND FISHING CAN ALTER THE DYNAMICS OF AN ECOSYSTEM.

c) All types of natural disturbance can occur in Québec.
FALSE. SOME NATURAL DISTURBANCES, SUCH AS SANDSTORMS OR VOLCANIC ERUPTIONS, CANNOT OCCUR IN QUÉBEC.

b) Ecological succession occurs only after a natural disturbance.
FALSE. IT ALSO OCCURS AFTER A HUMAN DISTURBANCE.

e) Transforming forests into farmland constitutes a natural disturbance.
FALSE. IT IS A HUMAN DISTURBANCE.

f) A flood following heavy rain is a natural disturbance.
TRUE. THIS DISTURBANCE IS NOT CAUSED BY HUMANS.

g) A natural disturbance is always less serious that a human disturbance.

FALSE. TSUNAMIS, EARTHQUAKES ARE VERY SERIOUS DISTURBANCESAND THEY ARE NOT PRODUCED BY HUMAN ACTIVITY

i) No ecosystem is immune to disturbances.

TRUE. ALL ECOSYSTEMS ARE VULNERABLE TO DISTURBANCES.

j) The current climate change has nothing to do with human disturbances.

FALSE. THE INCREASE IN THE GREENHOUSE EFFECT THAT PRODUCED THE CURRENT CLIMATE CHANGE IS DUE TO THE COMBUSTION OF FOSSIL FUELS, WHICH IS A HUMAN ACTIVITY

k) ***What is ecological succession?***

ECOLOGICAL SUCCESSION IS THE SERIES OF CHANGES THAT OCCUR IN AN ECOSYSTEM AFTER A DISTURBANCE WHICH CONTINUE UNTIL THE BALANCE OF THE ECOSYSTEM IS RESTORED.

l) The current increase in the greenhouse effect is considered a human disturbance. **List five effects that this disturbance has on the planet.**

CLIMATE CHANGE; INCREASE IN SEA LEVEL; ACID RAIN; INCREASE IN THE FREQUENCY OF DROUGHTS; INCREASE IN THE FREQUENCY OF FLOODS;