SL Paper 1

Which gas will enhance the greenhouse effect if released into the atmosphere?

A. Hydrogen
B. Oxide of nitrogen
C. Oxygen
D. Nitrogen

Which of the following trophic groups include fungi?

A. Detritivores
B. Autotrophs
C. Saprotrophs
D. Producers

Which category of organisms is correctly described by its method of nutrition and site of digestion?

	Category of organism	Method of nutrition	Site of digestion
A.	consumer	heterotrophic	internal
B.	saprotroph	autotrophic	external
C.	producer	autotrophic	internal
D.	detritivore	heterotrophic	external

What term can be used to describe clams that eat decaying plant matter?

A. Detritivores
B. Tertiary consumers
C. Saprotrophs
D. Decomposers

What is lost between trophic levels in ecosystems and cannot be recycled?

A. Heat

B. Nitrogen

C. Carbon compounds

D. Biomass

What is the classification of an organism that is able to make organic compounds from inorganic nutrients?

A. Autotroph
B. Consumer
C. Detritivore
D. Saprotroph

Why do food chains in an ecosystem rarely contain more than five organisms?

A. Nutrients are recycled by the decomposers back to the producers.
B. Nutrients are lost from the ecosystem when organisms die.
C. The conversion of food into growth by an organism is not very efficient.
D. Energy is recycled by the decomposers back to the producers.

What is recycled in an ecosystem?

A. Nitrogen, carbon and energy are all recycled.
B. Nitrogen and carbon are recycled but not energy.
C. Nitrogen is recycled but not carbon or energy.
D. Nitrogen, carbon and energy are not recycled.

Global warming threatens the survival of Arctic foxes. Which of the following factors could be involved?

I. Competition with other fox species spreading north
II. Reduction in numbers of prey species of Arctic foxes
III. Decrease in oxygen availability to Arctic foxes

A. I only
B. I and II only
C. II and III only
D. I, II and III

In a pond, two species of fish feed on insects and worms. The insects feed on the green plants that live in the water. What constitutes a population in this ecosystem?

A. All the living organisms
B. All the animals
C. All the fish
D. All the fish of one species

What is an ecosystem?

A. An environment in which an organism normally lives
B. A group of organisms of the same species inhabiting an area
C. A group of populations living and interacting with each other in an area
D. A community and its abiotic environment

The following statements refer to a pyramid of energy.

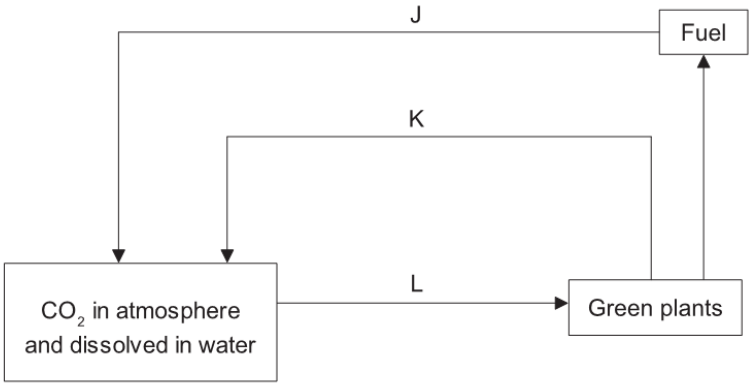
I. Some material is not assimilated by each trophic level.
II. Energy transformations are never 100 % efficient.
III. Heat is lost during photosynthesis.

Which of the statements give the reason why a pyramid of energy is narrower at the top than at the bottom?
A. I only
B. I and II only
C. II and III only
D. I, II and III

What is a community?

A. A group of organisms living and interacting in the same trophic level
B. A group of populations living and interacting in a food chain
C. A group of organisms of the same species living and interacting in an ecosystem
D. A group of populations living and interacting in an area

The diagram shows the carbon cycle.



[Source: © International Baccalaureate Organization 2017]

Which two processes correspond to the labelled arrows?

A. K is combustion and L is catabolism.

B. J is anabolism and K is respiration.

C. J is combustion and K is respiration.

D. J is anabolism and L is catabolism.

Which group of organisms in the carbon cycle converts carbon into a form that is available to primary consumers?

A. Decomposers
B. Saprotrophs
C. Detritus feeders
D. Producers

Which of the following is the best definition of a population?

A. A group of individuals that can interbreed and produce fertile offspring
B. The number of individuals of the same species in a given area
C. A group of species living and interacting with each other in a given area
D. The total number of individuals in a given area

What best describes the mode of nutrition of a heterotroph?

A. It ingests only non-living organic matter.
B. It obtains organic molecules from other organisms.
C. It synthesizes its organic molecules from inorganic substances.
D. It produces its organic molecules from chemical reactions using light.

Euglena is a unicellular organism that feeds on bacteria and uses CO_2 as a carbon source. Which describes the nutrition of this organism?

A. Autotrophic only

B. Heterotrophic only

C. Saprotrophic only

D. Autotrophic and heterotrophic

What term refers to organisms of the same species, living in a specified area and time?

A. Population
B. Community
C. Family
D. Genus

Which of the following ecological units includes abiotic factors?

A. A community
B. An ecosystem
C. A population
D. A trophic level

What is a potential consequence of the rise in global temperatures on the Arctic ecosystem?

A. Increased exposure to UV light
B. Increased rate of decomposition of detritus
C. Decreased success of pest species
D. Increase in the ice habitat available to polar bears

What contributes to the enhanced greenhouse effect?

A. Ozone from violent thunderstorms

B. Carbon particles in diesel engine exhaust

C. Methane from agricultural sources

D. Carbon dioxide from active volcanoes around the world

What are the units of a pyramid of energy?

A. kJ m^{-2} yr^{-1}
B. kJ m^{-1} yr^{-1}
C. J m^{-3} s^{-1}
D. J m^{2} s^{-1}

Zoophobas morio is an insect. Its larvae feed on bat feces in caves in Guatemala. What type of organism is a *Zoophobas morio* larva?

A. Autotroph

B. Consumer

C. Detritivore

D. Saprotroph

At each trophic level energy is lost. How is this energy regained by the ecosystem?

A. Heat
B. Nutrients
C. Photosynthesis
D. Recycling

What are examples of greenhouse gases?

A. Ethane and ozone

B. Methane and nitrogen

C. Methane and carbon dioxide

D. Ethane and oxygen

In an area of forest measuring 100 m by 100 m, samples were taken to estimate the number of silver maple (Acer saccharinum) trees in the forest. The number of trees counted in each of five areas of 400 m^2 was recorded.

	3			
			5	
4		5		
			8	

Approximately how many silver maple trees are in the 10000m^2 area of forest?

A. 5

B. 25

C. 125

D. 625

What do records from the twentieth and twenty-first century show about the concentration of carbon dioxide in the atmosphere?

A. An upward trend with annual fluctuations
B. An upward trend with no annual fluctuations
C. Annual fluctuations but no overall trend
D. Random fluctuations and no overall trend

What limits the length of food chains in an ecosystem?

A. The size of individual organisms
B. Competition between organisms
C. The loss of energy between trophic levels
D. Natural selection

Which statement describes the term species?

A. Members of the same ecological community

B. Organisms that reproduce together to produce fertile offspring

C. Organisms of the same type in a population

D. The first word in the binomial name of an organism

What is a population?

A. Organisms of the same genus living in an ecosystem

B. Organisms living together and interacting in the same habitat

C. Organisms of a species living together in the same area

D. Organisms that can breed together

What favours the production of peat?

I. Presence of organic matter

II. Anaerobic conditions

III. Acidic conditions

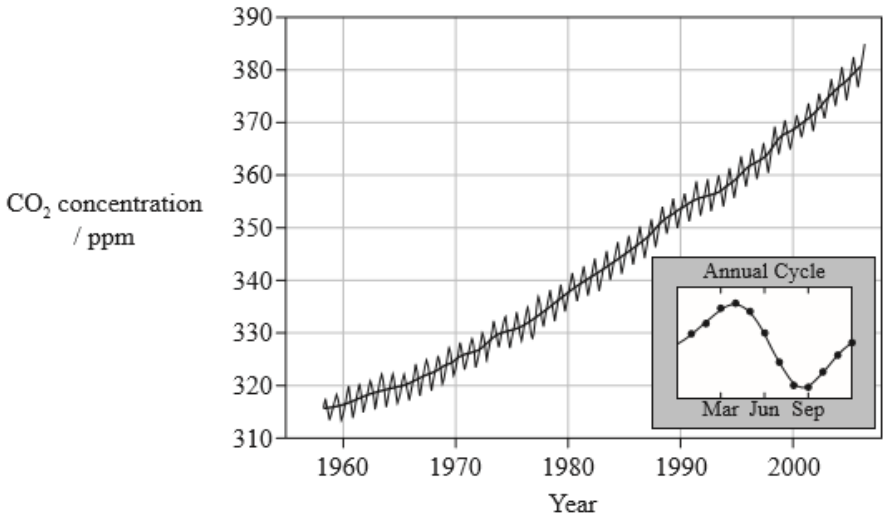
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

The graph below shows variation in the concentration of CO_2 in the atmosphere as measured at Mauna Loa in Hawai'i. The small inset graph shows the variations in CO_2 during a one year period.



[Source: adapted from Dr P Tans, NOAA Earth System Research Laboratory]

Why does the amount of CO_2 fall between April and August?

A. Seasonal increase in the rate of photosynthesis in northern hemisphere forests
B. Seasonal decrease in the rate of photosynthesis in northern hemisphere forests
C. Seasonal decrease in the rate of fossil fuel consumption
D. Seasonal increase in the amount of CO_2 taken up by the oceans

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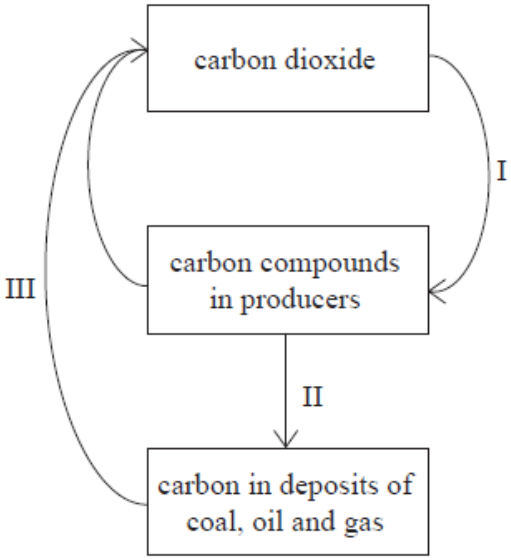
The diagram below shows some of the links in the carbon cycle.



What processes are taking place at I, II and III?

	I	II	III
A.	photosynthesis	fossilization	combustion
B.	cell respiration	fossilization	greenhouse effect
C.	photosynthesis	decomposition	combustion
D.	cell respiration	decomposition	greenhouse effect

By which mechanism do greenhouse gases contribute to global warming?

A. Their higher concentration absorbs more long wave radiation coming from the Sun.

B. Short wave radiation emitted from the Earth's surface increases with their concentration.

C. They absorb higher amounts of long wave radiation emitted from the Earth's surface as their concentration increases.

D. They absorb higher amounts of short wave radiation caused by increased combustion of fossilized organic matter.

Which characteristic of water vapour classifies it as a greenhouse gas?

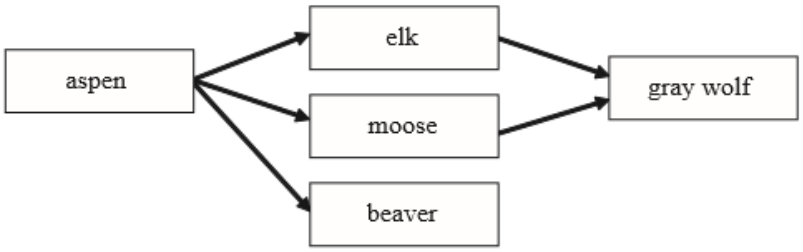
A. It absorbs and then re-emits some of the long wave radiation emitted by the Earth's surface.

B. It prevents short wave radiation from reaching the Earth's surface.

C. It absorbs UV radiation but does not re-emit it.

D. It absorbs infra-red radiation but does not re-emit it.

The following diagram shows part of a food web from Yellowstone Park.



What would be the short-term effects on the populations of the other species if the gray wolf were exterminated?

	Beaver	Moose	Elk	Aspen
A.	Increase	Decrease	Increase	Increase
B.	Decrease	Decrease	Decrease	Decrease
C.	Increase	Increase	Decrease	Increase
D.	Decrease	Increase	Increase	Decrease

Two populations of the same fish species were fed different diets to investigate the effect of differing nutrition on their growth. What is an appropriate method to determine the significance of a resulting difference?

A. Calculate the mean for each population

B. Calculate the standard deviation for each population

C. Graph the results

D. Perform a *t*-test

The table shows the monthly CO_2 concentrations in mg L^{-1} taken at two monitoring stations.

Station \ Month	Jul 2011	Aug 2011	Sept 2011	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	Jun 2012
Cape Grim, Australia	388	389	389	389	389	389	389	389	389	389	389	390
Mauna Loa, Hawaii, USA	392	390	389	389	390	392	393	394	394	396	397	396

What is directly indicated by the data?

A. CO_2 concentration in the atmosphere varies from place to place.

B. Cape Grim is less affected by global warming than Mauna Loa.

C. CO_2 creates a greenhouse effect at both locations.

D. The standard deviation for Cape Grim is higher than standard deviation for Mauna Loa.

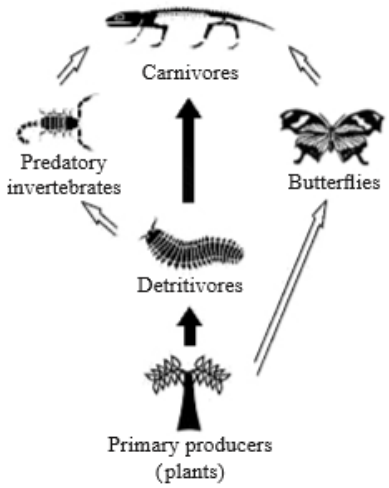
What restricts the length of a food chain?

A. Energy losses between the trophic levels
B. A greater biomass at the higher trophic levels
C. The number of species in the food web
D. The consumption of waste by detritivores

Which pair of statements is correct?

	Autotroph	Heterotroph
A.	obtains organic molecules from other organisms	synthesizes organic molecules from inorganic molecules
B.	synthesizes organic molecules from inorganic molecules	obtains organic molecules from other organisms
C.	synthesizes inorganic molecules from organic molecules	synthesizes organic molecules from inorganic molecules
D.	obtains inorganic molecules from other organisms	obtains inorganic molecules from other organisms

The energy passing from the detritivores to the predatory invertebrates in this food web is 14 000 kJ m^{-2} $year^{-1}$.

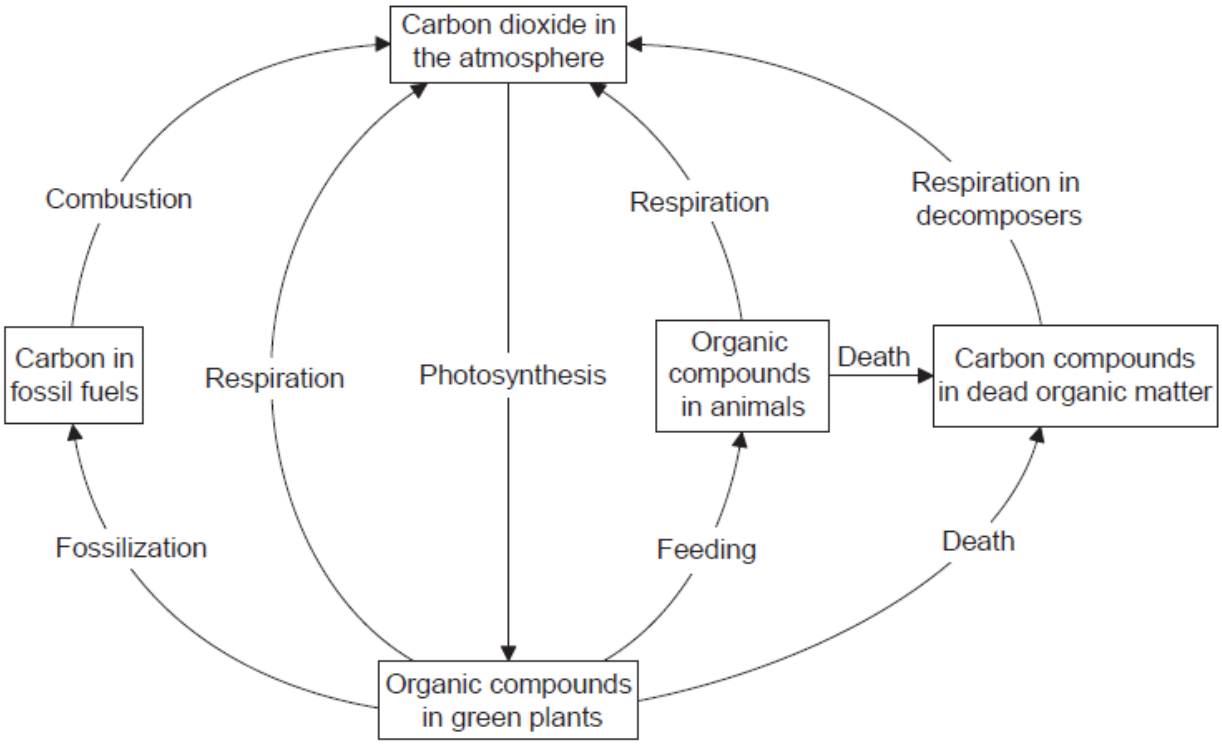


[Adapted with permission from http://jogginsfossilcliffs.net/cliffs/biodiversity/]

Approximately how much energy (in kJ m^{-2} $year^{-1}$) passes from the predatory invertebrates to the carnivores?

A. 140
B. 1400
C. 14 000
D. 140 000

The diagram represents the carbon cycle.



[Source: adapted from http://content.answcdn.com]

Which process has the greatest relative role in transferring carbon?

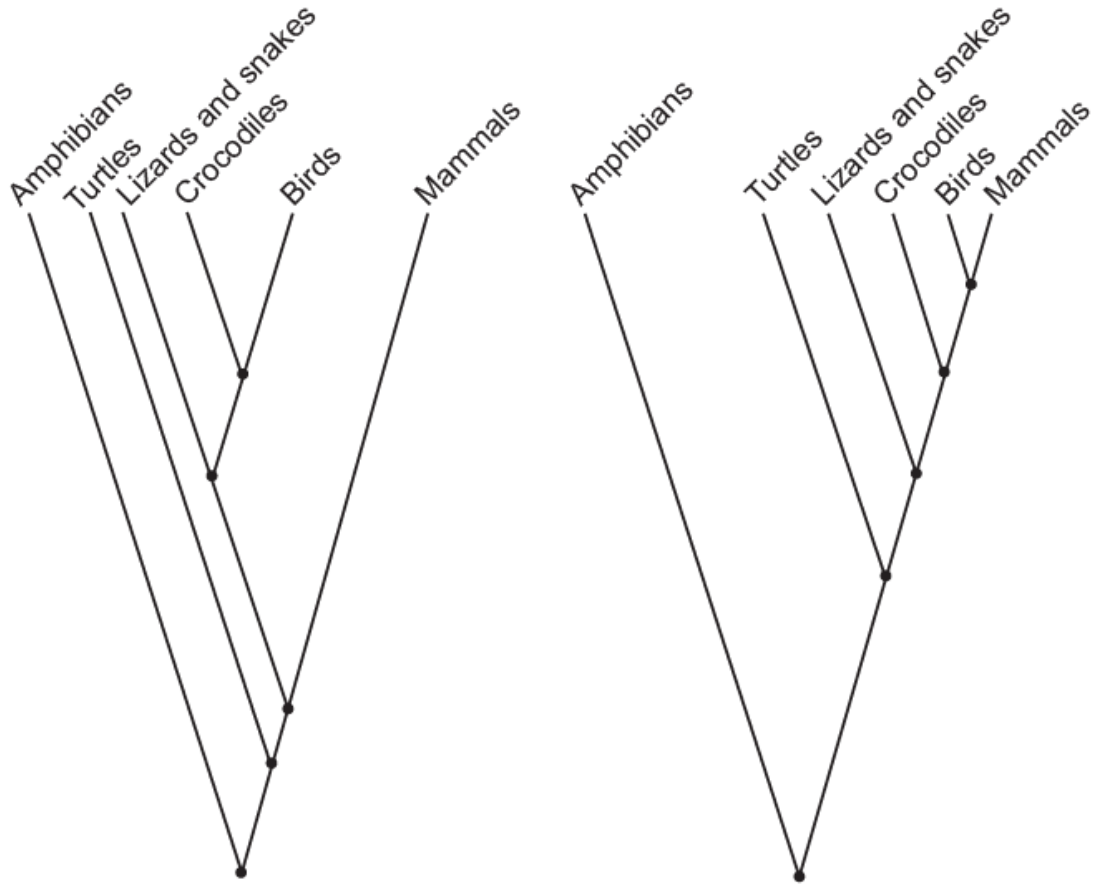
A. Decomposition

B. Combustion

C. Photosynthesis

D. Cell respiration

Cladograms can be created by comparing DNA or protein sequences. The cladogram on the left is based on DNA sequences and the cladogram on the right is based on comparing protein sequences.



What is the reason that cladograms based on DNA sequences are more reliable predictors of the phylogenetic relationship of species than cladograms based on protein sequences?

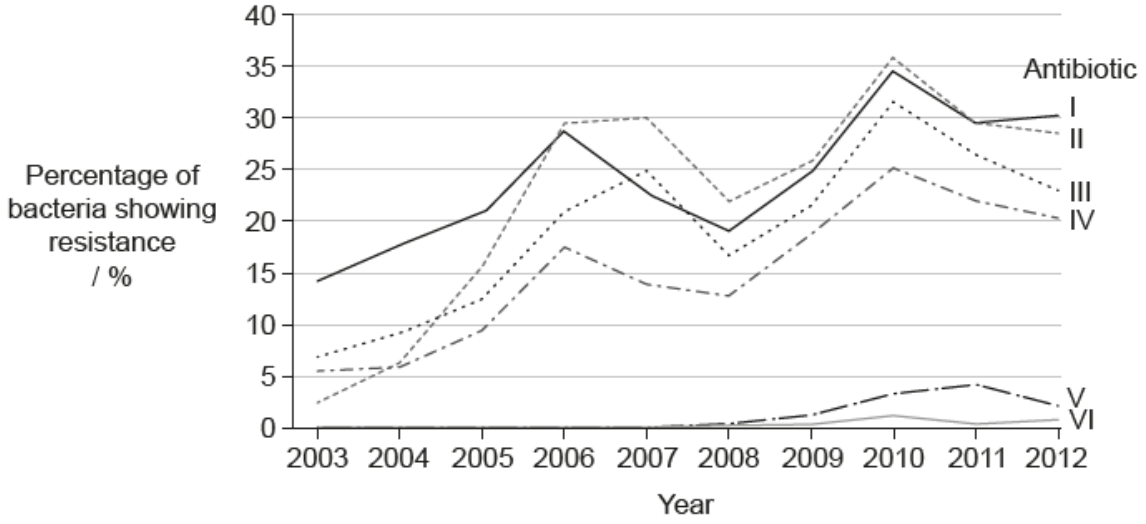
A. Amino acids are not as chemically stable as DNA nucleotides.

B. DNA mutates but amino acids do not.

C. Several different triplets of bases can code for the same amino acid.

D. There are 20 different amino acids but only 4 nucleotides.

The bacterium *Neisseria gonorrhoeae* causes infections related to the human reproductive system. The graph shows the percentage of samples in which this bacterium showed resistance to six antibiotics over a period of ten years.



[Source: © All rights reserved. National Surveillance of Antimicrobial Susceptibilities of *Neisseria gonorrhoeae* Annual Summary 2012. Public Health Agency of Canada, 2012. Translated, adapted and reproduced with permission from the Minister of Health, 2017.]

What is a possible explanation for the total percentage resistance being larger than 100% in 2010?

A. People do not take the antibiotics as prescribed.

B. More people have been sampled in that year.

C. There was an epidemic of *Neisseria gonorrhoeae* in that year.

D. Some bacteria are resistant to more than one antibiotic.

The image shows a female Golden Orb-weaving spider *(Nephila plumipes*). They can grow as large as 4 cm and build webs strong enough to trap small birds for food.

[Source: adapted from www.cli.nsw.edu.au]

Which of the following describe(s) this spider?

I. Primary consumer

II. Heterotroph

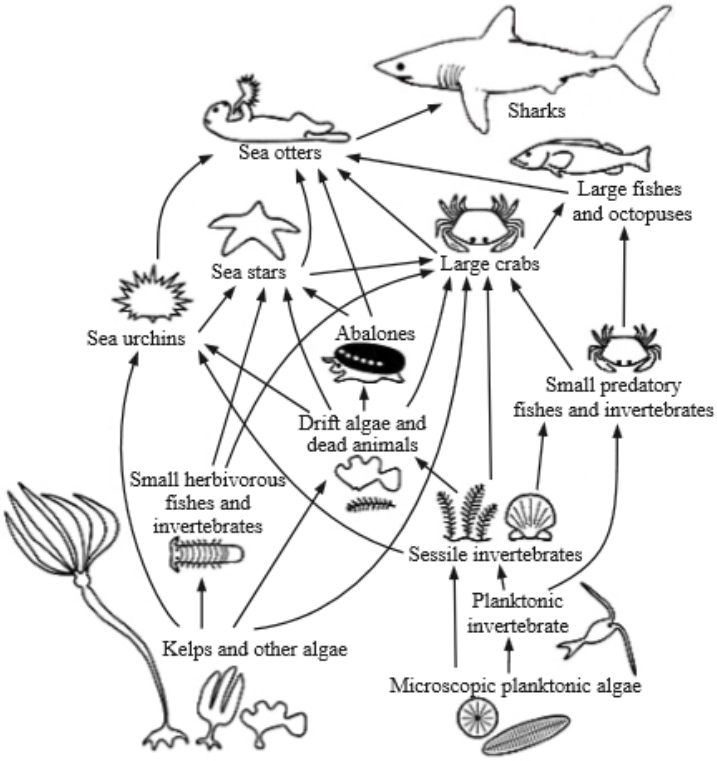
III. Arthropod

A. I only

B. I and II only

C. II and III only

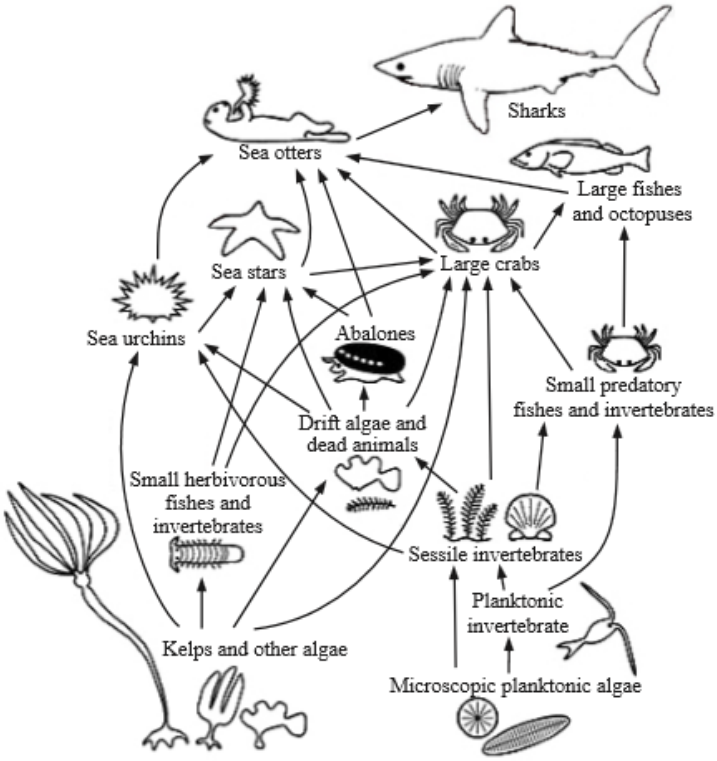
D. I, II and III



[Source: http://cbc.amnh.org/crisis/foodweb.html]

What will happen to the food web above if the sea otter disappears?

A. Large fish increase and sea urchins decrease.
B. Abalones increase and sharks increase.
C. Sea urchins increase and kelps decrease.
D. Sea stars decrease and sharks increase.

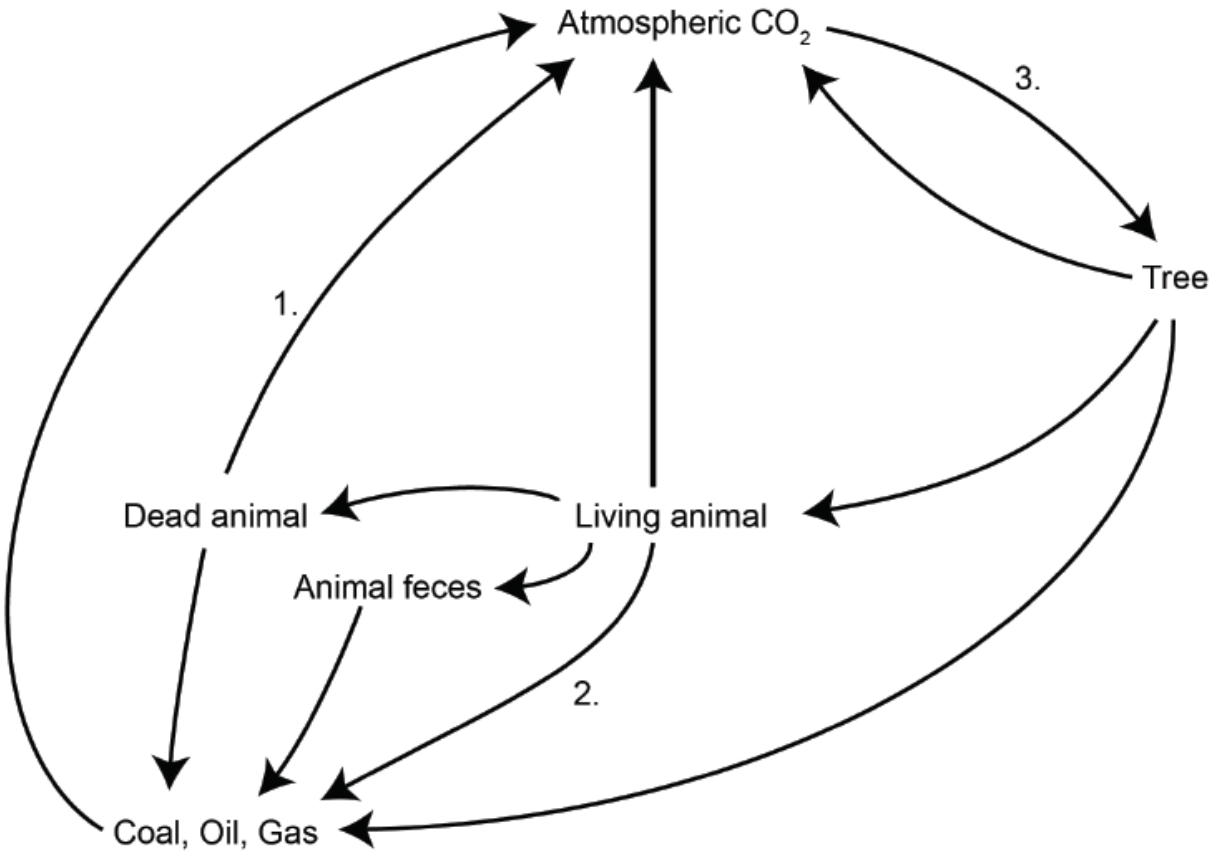


[Source: http://cbc.amnh.org/crisis/foodweb.html]

Which organism in this food web is both a secondary and tertiary consumer?

A. Large crab
B. Small herbivorous fish
C. Shark
D. Microscopic planktonic algae

The diagram shows a version of the carbon cycle. What is indicated by the numbers?



[Source : © International Baccalaureate Organization, 2017]

	1	2	3
A.	Death of consumers	Cell respiration in saprotrophs	Cell respiration in producers
B.	Death of consumers	Incomplete decomposition	Photosynthesis in producers
C.	Cell respiration in saprotrophs	Incomplete decomposition	Photosynthesis in producers
D.	Cell respiration in consumers	Cell respiration in saprotrophs	Cell respiration in producers

Image I shows a spotted hyena (Crocuta crocuta) and image II shows a leopard tortoise *(Geochelone pardalis*).

Image I

[Source: adapted from www.corbisimages.com]

Image II

[Source: adapted from http://mikeelliscb.edublogs.org]

Based on their diet, the feces of spotted hyenas appear white because of high calcium content. Leopard tortoises eat hyena feces. What would explain such tortoise behaviour?

A. They are saprotrophs.

B. They transform energy with 100 % efficiency.

C. They need to form bones and shell.

D. They only eat inorganic matter.