HL Paper 1

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 contributes to rising atmospheric concentrations of carbon dioxide and increases in average global temperature?

A. An increase in the shorter wavelength radiation emitted by Earth
B. An increase in longer wavelength radiation emitted by Earth
C. An increase in the combustion of fossilized organic matter
D. The depletion of ozone in the stratosphere

Which represents a correct food chain from this web?

A. stickleback → midge larva → unicellular algae
B. ciliates → *Daphnia* → stickleback → dragonfly nymph
C. diatom → midge larva → caddisfly larva → stickleback
D. filamentous algae → mayfly nymph → leech → stickleback

How is peat formed?

A. From methanogenic archaeans under anaerobic and acidic conditions in deep sea vents
B. From partially decomposed organic matter under anaerobic and acidic conditions in waterlogged soils
C. From porous limestone under high pressure, aerobic and alkaline conditions in ocean beds
D. From bituminous coal under high pressure, anaerobic and acidic conditions below ground

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Which hypothesis is supported by evidence from ecological research?

A. Decomposers are the final stage in the food chain.

B. Producers depend upon consumers more than on decomposers.

C. Decomposers help to recycle energy from food chains.

D. Producers use nutrients that decomposers help to recycle.

Human activity leading to the emission of greenhouse gases may be a cause of global warming.

According to the precautionary principle, what should be done about greenhouse gas emission?

A. Analyse historical records from monitoring stations to see the trends in carbon dioxide emissions

B. Obtain more evidence by carrying out research on greenhouse gas emission

C. Take measures to lower greenhouse gas emission without further evidence

D. Develop strategies for coping with higher global temperatures

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Which of the following is a consequence of global temperature rise on arctic ecosystems?

A. Increased rates of decomposition of detritus trapped in permafrost
B. Decrease of geographical range of habitats for temperate species
C. Decrease of pest species and increase of permafrost species
D. Increase of geographical range of habitats for permafrost species

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Global warming caused by the enhanced greenhouse effect is likely to have major consequences for arctic ecosystems. Which of the following are

likely to occur in the arctic if the Earth's surface temperature rises?

I. Decreased rates of decomposition of detritus

II. Increased range of predators from temperate regions

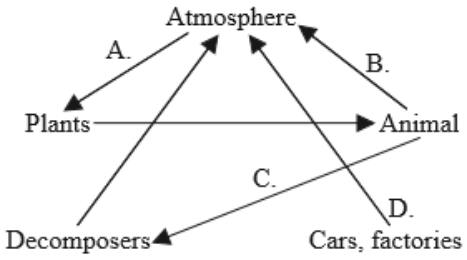
III. Increase in numbers of pest species and pathogens

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

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.

The diagram is a representation of a carbon cycle. Which arrow will reduce the greenhouse effect?



What is a community composed of?

A. Habitats
B. Populations
C. Abiotic factors
D. Biotic and abiotic factors

The statement is about the role of some bacteria in ecosystems.

> "Bacteria play an important role in recycling nutrients in ecosystems. They live on organic wastes and dead organisms and digest their molecules. They then absorb some of these molecules for their own metabolism, and the rest is used by other organisms."

What is the mode of nutrition of these bacteria?

A. They are autotrophs.
B. They are consumers.
C. They are saprotrophs.
D. They are detritivores.

Which term best defines a group of populations living and interacting with each other in an area?

A. Ecology
B. Community
C. Species
D. Ecosystem

The fungus *Calocera viscosa* obtains its nutrients from decaying conifer trees. Which pair of terms describes *C. viscosa's* nutrition?

A.	autotroph	herbivore
B.	autotroph	saprotroph
C.	heterotroph	herbivore
D.	heterotroph	saprotroph

What is an example of the precautionary principle?

A. Avoiding cigarettes as they increase the chances of lung cancer
B. Reducing carbon dioxide emissions as they may cause global warming
C. Avoiding strong sunlight as it increases the chances of skin cancer
D. Reducing cod fishing to increase fish stocks

Slime moulds (*Acrasiomycota*) are protoctists. They feed on decaying organic matter, bacteria and protozoa.

Which of the terms describes their nutrition?

I. Detritivore
II. Autotroph
III. Heterotroph

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

What is the mode of nutrition of midge larva?

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

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

What is the best definition of the greenhouse effect in the Earth's atmosphere?

A. A naturally occurring effect by which shorter wavelength radiation is trapped

B. A naturally occurring effect by which longer wavelength radiation is trapped

C. An effect of pollution by which shorter wavelength radiation is trapped

D. An effect of pollution by which longer wavelength radiation is trapped

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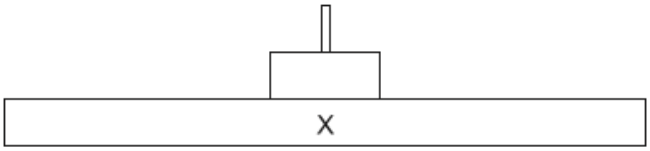
The diagram represents a pyramid of energy.



What level does the letter X represent?

A. Light
B. Primary consumers
C. Abiotic environment
D. Producers

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}

Which are characteristics of a species?

I. The potential to interbreed to produce fertile offspring
II. The formation of a population with members of the same species within a community
III. The overproduction of offspring

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

D. I, II and III

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 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

Methanogens produce methane gas. What is this gas converted to in the atmosphere?

A. Carbon dioxide and oxygen

B. Ethanol and carbon dioxide

C. Carbon monoxide and ozone

D. Carbon dioxide and water

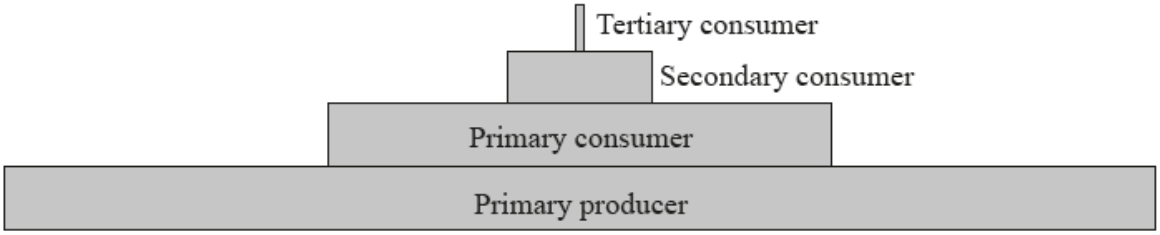
The scarlet cup fungus (*Sarcoscypha coccinea*) obtains its nutrition from decaying wood by releasing digestive enzymes into the wood and absorbing the digested products.

Which of the following terms describe(s) the fungus?

I. Autotroph
II. Heterotroph
III. Saprotroph

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

The following shows an energy pyramid.



How is energy lost between the trophic levels?

A. photosynthesis, birth of an organism and digestion

B. respiration, death of an organism and egestion

C. recycling of nutrients, death of an organism and egestion

D. respiration, birth of an organism and digestion

How is energy passed from one trophic level to the next?

I. Food
II. Light
III. Heat

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

The image shows a transect through a stream and a field.

Which calculation would test for the association between two species of plants from quadrat data from section A and section B of the field?

A. Correlation coefficient

B. Random numbers sampling

C. Standard deviation

D. Chi-squared

What is a consequence of a global temperature rise on arctic ecosystems?

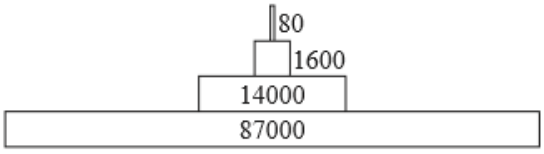
A. Decrease in CO_2 released from decomposing detritus
B. Increase in the greenhouse effect
C. Decrease in ocean level
D. Increase in pest species

Which of the following are greenhouse gases?

I. Oxides of nitrogen
II. Carbon dioxide
III. Methane

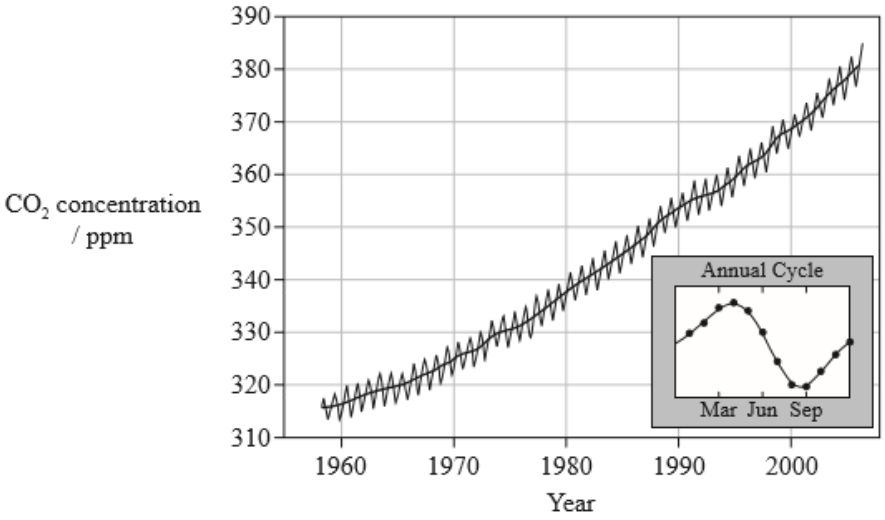
A. I and II only
B. I and III only
C. II and III only
D. I, II and III

The diagram shows a pyramid of energy for a wetland environment. What units would be appropriate for the values shown?



A. kg yr^{-1}
B. kJ m^{-2} yr^{-1}
C. J m^{-2}
D. mg dry mass m^{-3}

The following graph refers to questions 19 and 20. It 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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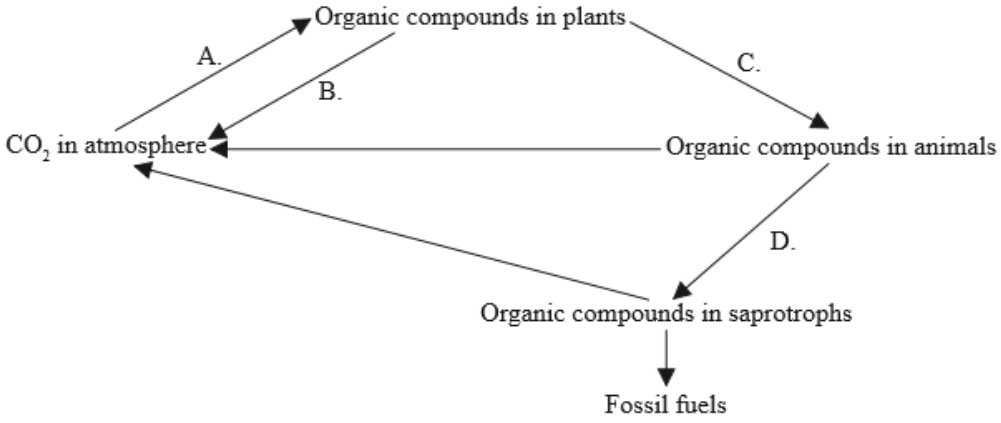
The diagram shows the carbon cycle. Which letter indicates respiration?



In ecosystems the amount of energy that passes from one trophic level to the next is called the conversion efficiency. What is the average conversion efficiency from primary to secondary consumers in most ecosystems?

A. 1 %
B. 10 %
C. 50 %
D. 90 %

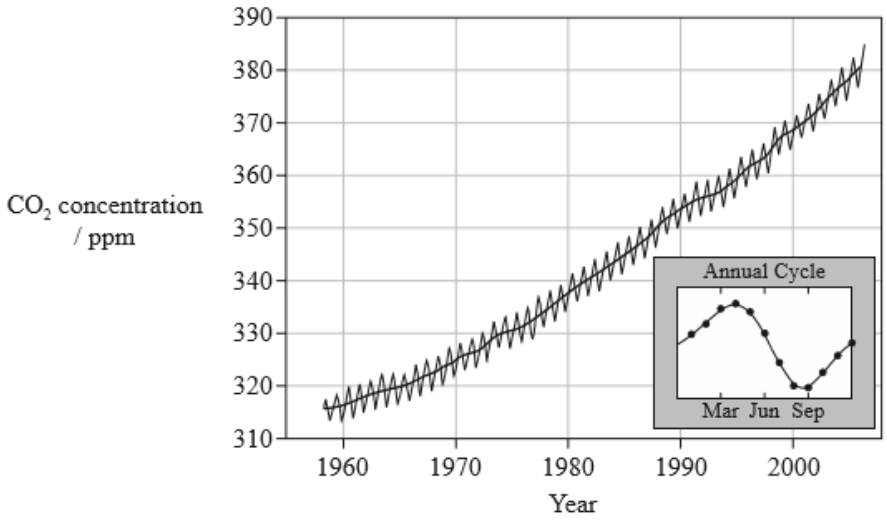
The table shows the monthly CO_2 concentrations in mg L^{-1} taken at two monitoring stations.

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.

The following graph refers to questions 19 and 20. It 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.

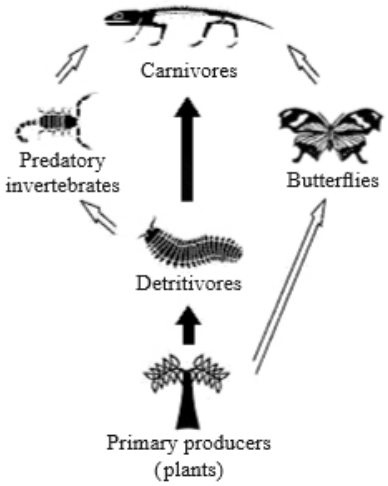


[Source: adapted from Dr P Tans, NOAA Earth System Research Laboratory]

What is the main cause of the increase in CO_2 levels from 1960 to 2000?

A. Burning fossil fuels
B. Destruction of the ozone layer
C. Increases in ultraviolet light penetrating the Earth's atmosphere
D. Reforestation

This question refers to the following food web.



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

The energy passing from the detritivores to the predatory invertebrates in this food web is 14 000 kJ m^{-2} $year^{-1}$. Approximately how much energy (in kJ m^{-2} $year^{-1}$) passes from the predatory invertebrates to the carnivores?

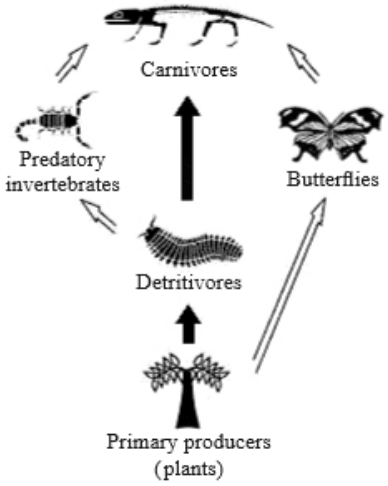
A. 140

B. 1400

C. 14 000

D. 140 000

This question refers to the following food web.



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

To which trophic level do the butterflies belong?

A. Producers
B. Primary consumers
C. Secondary consumers
D. Tertiary consumers

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

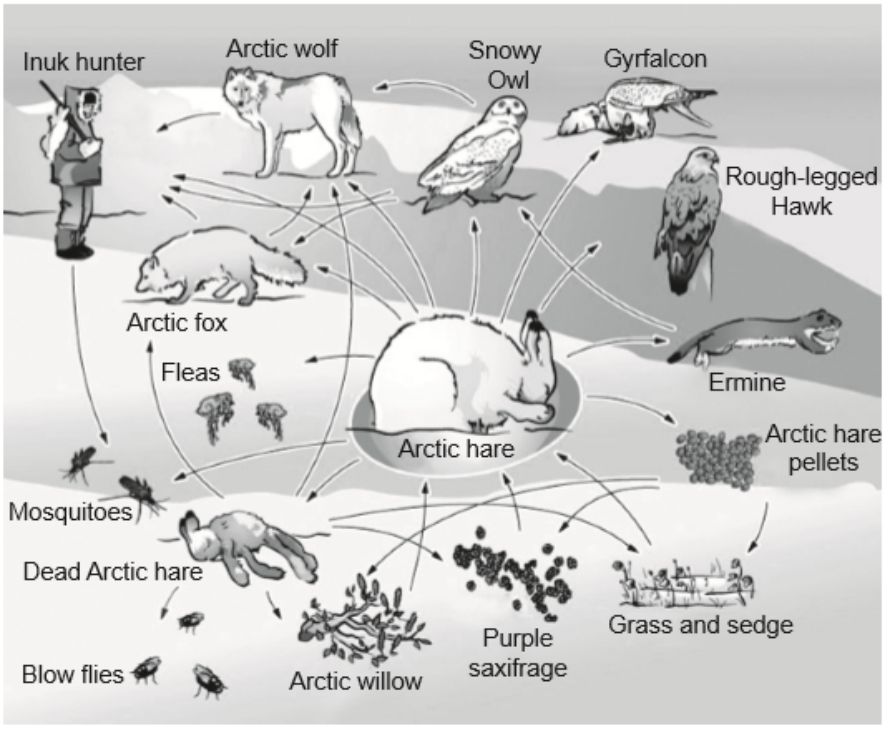
A. I only

B. I and II only

C. II and III only

D. I, II and III

The image shows an Arctic food web.



[Source: Ukaliq, the Arctic Hare (http://nature.ca/ukaliq/) © Canadian Museum of Nature]

What is the role of the Arctic hare?

A. Detritivore
B. Primary consumer
C. Secondary consumer
D. Saprotroph