

DISCOVERING OUR WORLD

Discovering the Earth's Atmosphere

The earth's atmosphere is an essential belt around the globe that sustains all living things. Primarily consisting of Nitrogen (71%) and Oxygen (28%), there are also trace amounts of many other gasses including Argon and Carbon Dioxide.

85% of these atmospheric gasses are found in the dense troposphere, the atmosphere's lowest layer. This is also the layer we alter with our pollutants and greenhouse gasses.

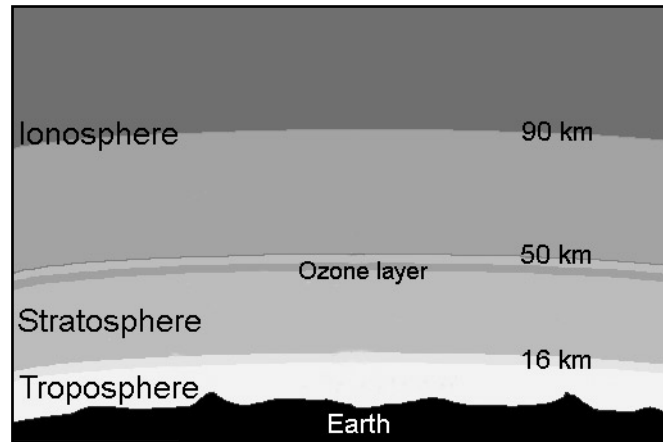
Above the troposphere is the stratosphere where ozone traps much of the ultraviolet radiation that is continually bombarding the earth.

Still higher is the ionosphere where solar radiation interacts with air molecules in the upper atmosphere to create many layers of ions.

This layer cake arrangement is fluid as the earth's atmosphere redistributes the sun's heat around the globe. As this happens, warm air rises causing low pressure air masses, and cold air descends to form high pressure air masses.

As these air masses collide, local weather is formed either in the form of high vertical storm clouds in advance of a cold front, or wispy Cirrus clouds in advance of a warm front.

The thankless task of trying to forecast the weather falls to meteorologists who sometimes accurately predict the onset of severe weather that saves many lives.



The major levels of the earth's atmosphere.

Word Check: Solar Radiation, Conduction, Convection, Greenhouse Effect, Ozone, Troposphere, Stratosphere, Ionosphere, Hydrologic Cycle, Humidity, Condensation, Air Mass, Cyclone.

Pre-viewing Questions:

1. Atmospheric conditions sometimes cause severe weather patterns. What types of severe weather affects your area from time to time?
2. In which direction do the prevailing winds blow in your area? In general, what type of weather do they bring?

Discovering our World

DISCOVERING THE EARTH'S ATMOSPHERE

This guide provides you with a summary of the program and follow-up questions (along with their answers). A list of web links leads to further information on the topic.

The question sheet is designed to be duplicated for class distribution.

Before Viewing: Give students an overview of the program. Use the program summary to help provide this introduction. Select pre-viewing discussion questions and vocabulary to provide a focus for students when they view the program.

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You can cut and paste text from the pdf file to compile your own set of questions or to enter links into a web browser.



ASTARTE RESOURCES

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Our Atmosphere: QUESTIONS

Chapter 1: Energy and the Atmosphere

1. What is solar radiation?
2. Is solar radiation constant across the earth's surface?
3. What is conduction?
4. What causes a heat shimmer?
5. What causes air to rise?
6. What is convection?
7. What are convection cells?
8. What is the earth's wind belt system?
9. Why is the wind belt system the driver of our everyday weather?
10. What is the troposphere?
11. What percentage of atmospheric gasses is contained in the troposphere?
12. Why doesn't smog and other pollution escape to the upper atmosphere?
13. What is the Greenhouse Effect?
14. What is a major cause of the Greenhouse Effect?

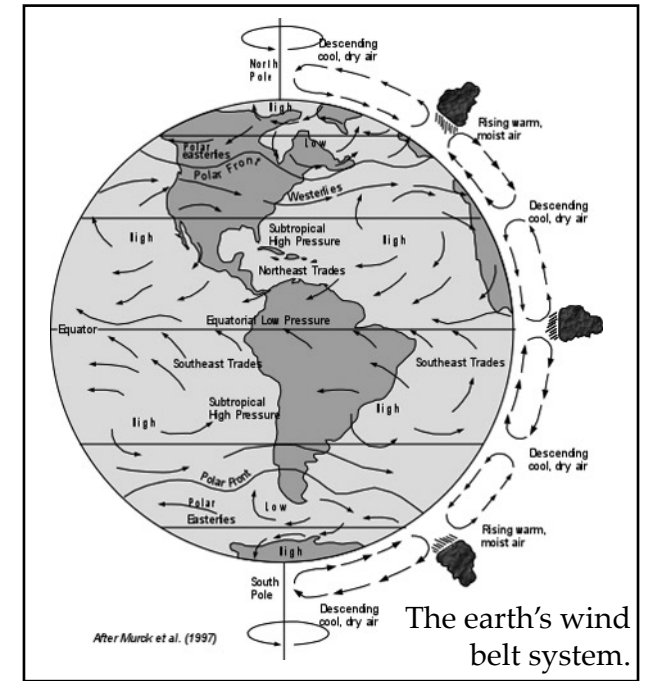
15. What is the result of the Greenhouse Effect?
16. What layer of the atmosphere sits on top of the troposphere?
17. What percentage of atmospheric gasses are contained in the stratosphere?
18. Why is the stratosphere warmer than the troposphere?
19. What is the ionosphere?
20. Why is it called the ionosphere?

Chapter 2: Moisture in the Atmosphere

21. What is the Hydrologic (or water) Cycle?
22. What drives the Hydrologic Cycle?
23. What is humidity?
24. What is condensation?
25. What is a cloud?
26. What is the Dew Point?
27. What type of things are covered under the term precipitation?

Chapter 3: Forecasting the Weather

28. What different sort of air masses form over the poles and the equator respectively?
29. What is a cyclone?
30. What is a front?
31. What happens at the boundary of a cold front?



32. What happens at the boundary of a warm front?
33. What does a meteorologist do?
34. What are tornadoes and hurricanes?

FURTHER INFORMATION

An animated diagram of our atmosphere:
<http://earthguide.ucsd.edu/earthguide/diagrams/atmosphere/>

On the Greenhouse Effect:
<http://www.greenhouse.gov.au/education/factsheets/index.html>

For more on our atmosphere:
http://www.ucar.edu/learn/1_1_1.htm

Our Atmosphere:

ANSWERS

Chapter 1: Energy and the Atmosphere

1. Solar radiation is the energy the earth receives from the sun.
2. No, solar radiation is stronger at the equator than at the poles.
3. Conduction is when energy is transferred by direct contact.
4. A heat shimmer is when energy is being transferred from the warm ground to the cooler air above.
5. Air rises when it is heated because it expands and becomes less dense.
6. Convection describes the cycle of warm air rising and cool air falling.
7. Convection cells are separate cycles of convection all happening simultaneously.
8. The wind belt system describes the bands around the earth where the wind blows in certain directions.
9. The wind belt system determines where the prevailing winds blow from and this, in turn, determines the weather.
10. The layer of the atmosphere closest to the earth's surface is the troposphere.
11. 85% of all atmospheric gasses are in the troposphere.

12. The troposphere is dense and therefore pollutants are trapped close to the ground (the troposphere is only about 16 km thick).
13. The Greenhouse Effect describes how pollutants are trapped close to the earth's surface like the glass of a greenhouse trapping warm air.
14. The burning of fossil fuels such as coal and petrol produce the gas that creates the Greenhouse Effect.
15. The Greenhouse Effect is warming the earth more than is natural.
16. The stratosphere is above the troposphere.
17. 14% of atmospheric gasses are contained in the stratosphere.
18. Ozone in the stratosphere absorbs ultraviolet radiation, protecting the earth's surface but warming the stratosphere.
19. The ionosphere is the topmost layer of our atmosphere.
20. The ionosphere takes its name from the fact that ions are created in this zone when solar radiation strikes air molecules in the upper atmosphere.

Chapter 2: Moisture in the Atmosphere

21. The Hydrologic Cycle describes the movement of water from the ocean, to the air, to the land, and back to the ocean again.
22. The Hydrologic Cycle is driven by solar radiation (to cause evaporation) and gravity (to cause rain/snow).

23. Humidity is a measure of the amount of moisture in the atmosphere.
24. Condensation occurs when water vapour is turned into water droplets.
25. A cloud is water vapour that has condensed around microscopic grains of dust.
26. The Dew Point is the point in the atmosphere where the air becomes cold enough to condense water vapour into water droplets.
27. The term precipitation covers, rain, snow, sleet and hail.

Chapter 3: Forecasting the Weather

28. Cool, dry air masses form over the poles and warm, moist air masses form over the equator.
 29. A cyclone is low pressure air rising in a spiral motion.
 30. A front is the boundary between two air masses where there is often unstable weather conditions.
 31. A cold front is cold air displacing warm air.
 32. A warm front is warm air rising over cool air.
 33. A meteorologist studies weather patterns and tries to forecast future weather.
 34. Both are forms of cyclones with the tornado being a small but powerful cyclone and a hurricane being a very large and often very powerful cyclone.
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DISCOVERING OUR WORLD

Discovering our Rivers, Lakes and Oceans

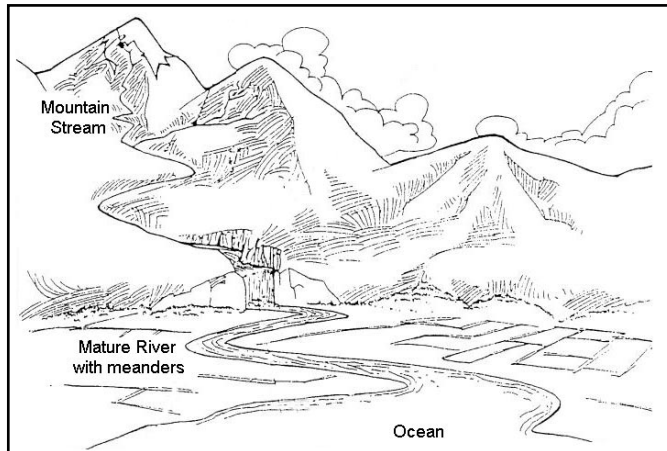
Water is one of the world's most abundant resources although much of it is salt-water in our oceans or ice; frozen solid in the polar ice caps and within alpine glaciers.

But the Hydrologic system is not static, polar ice melts and ocean waters evaporate to keep the system in a continual cycle that brings water from the ocean to the land and back to the ocean again.

After falling on the land in the form of rain or snow, this water begins a slow transformation of the land across which it travels. Some seeps into groundwater to emerge as a spring kilometres away, while other water becomes runoff and makes its way into streams and rivers.

Ultimately the water ends up in the oceans that cover 71% of the earth's surface. These oceans have been salty for a long time, probably since they were first created. The oceans' salinity comes from dissolved salts being washed from the land and from volcanic gasses, especially from the large number of volcanoes that continue to be active beneath the sea.

Due to the constant shifting of the earth's plates, the ocean floor provides stunning examples of towering mountain ranges and dizzying chasms; at a scale dwarfing anything found on dry land. Even the world's longest mountain range, the mid-ocean ridge, is largely concealed beneath the ocean's waves.



With most of the earth's water tied up in ice or oceans, only a small proportion is left as fresh water in our rivers, lakes and groundwater. Of this, not all is useable by humans as a mere 0.03% of all the world's water is easily accessible as fresh drinking water. This makes water the world's most abundant, but precious, resource.

Word Check:

Hydrologic Cycle, Evaporation, Condensation, Precipitation, Transpiration, Salinity, Plate Tectonics, Drainage Basin.

Pre-viewing Questions:

1. Name some ways in which we need to better manage our use of water.
2. How can the power of water be both destructive as well as constructive?

Discovering our World DISCOVERING OUR RIVERS, LAKES & OCEANS

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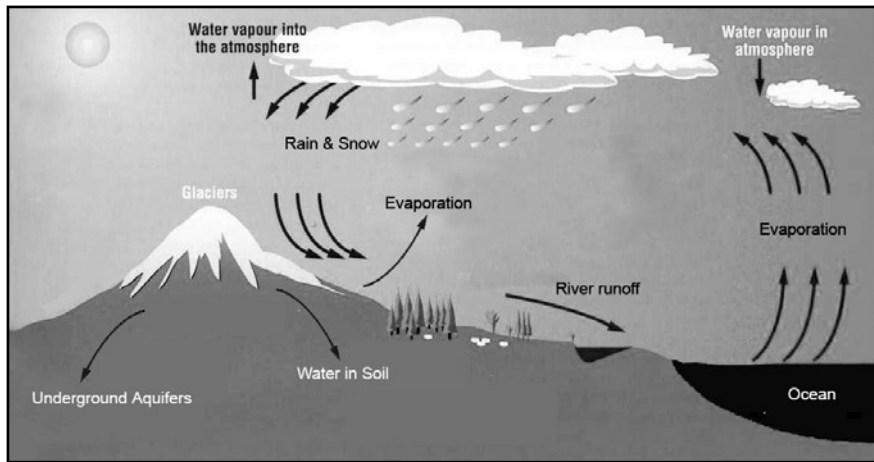
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ASTARTE RESOURCES

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Our Rivers, Lakes and Oceans QUESTIONS

1. How much of the earth's surface is covered with water?

Chapter 1: The Hydrologic (Water) Cycle

- What is water vapour?
- What is the Hydrologic or Water Cycle (shown above)?
- What drives the Hydrologic Cycle?
- What are the four stages of the Hydrologic Cycle?
- What is evaporation?
- What is transpiration?
- What is condensation?
- What is precipitation?
- What two things can happen to precipitation that falls over land?

11. What are some ways in which humans have interfered with the earth's natural Hydrologic Cycle?

Chapter 2: The Earth's Oceans

- What is salinity?
- Why are the oceans salty?
- What has the process of Plate Tectonics created on the ocean floor?

- What is a continental shelf?
- What proportion of marine animals live on or near the continental shelf?
- What are seamounts?
- Where can you find the tallest mountains, the deepest chasms and the longest mountain ranges in the world?
- Why do ocean currents generally flow in a clockwise direction in the northern hemisphere and anti-clockwise in the southern hemisphere?

20. Why do tides rise and fall?

Chapter 3: The Earth's Fresh Water

- Where is most of the earth's fresh water stored?
- How thick is the ice sheet in Antarctica?

- What is a Drainage Basin?
- Describe the changes that happen to rivers as they flow from the top of the Drainage Basin to the bottom?
- What can happen to lakes over time?

Chapter 4: The Earth's Water: Today & Tomorrow

- What proportion of all the world's water is fresh, useable water?

FURTHER INFORMATION

ABC Televisions site 'Oceans':

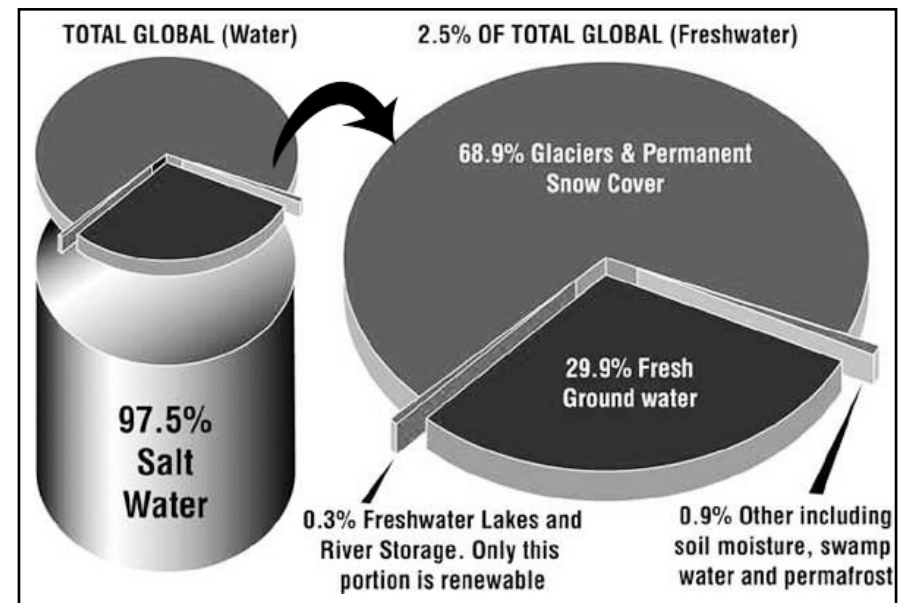
<http://www.abc.net.au/oceans/alive.htm>

On Australian coasts:

<http://www.deh.gov.au/coasts/>

Another good site on Australian oceans:

<http://www.oceans.gov.au/education/index.jsp>



Our Rivers, Lakes and Oceans

ANSWERS

1. 71% of the earth's surface is covered by water.

Chapter 1: The Hydrologic (Water) Cycle

2. Water vapour is the gaseous form of water.
3. The Hydrologic Cycle describes the movement of water from the ocean to the land and back to the ocean again.
4. The Hydrologic Cycle is driven by solar radiation (to cause evaporation) and gravity (to cause rain/snow).
5. The four stages of the Hydrologic Cycle are; Evaporation, Condensation, Precipitation and ground flow.
6. Evaporation is the transfer of solar energy to transform liquid water into water vapour.
7. Transpiration is when plants give off water through their leaves.
8. Condensation is the process by which cooling water vapour is turned into liquid water in the atmosphere.
9. Precipitation is the return of water from the atmosphere to the earth's surface. This could be in the form of rain, snow, sleet or hail.
10. Precipitation over land either goes into groundwater or runoff.

11. Excessive pumping of groundwater, polluting groundwater, clearing vegetation and adding pollutants to the atmosphere all contribute to disrupt the natural Hydrologic Cycle.

Chapter 2: The Earth's Oceans

12. Salinity is the measure of the amount of salt in either water or soil.
13. The oceans are salty because rivers wash dissolved salts from the land into the oceans. Gasses from volcanoes can also add to the ocean's salinity.
14. Plate Tectonics has formed undersea mountain ranges, volcanoes and deep chasms far grander than anything we find on dry land.
15. The continental shelf is the area of sea-bed surrounding a continent that is less than 600 feet (200 m) deep.
16. Around 90% of marine animals live on or near the continental shelf.
17. Seamounts are undersea volcanoes that sometimes break the surface.
18. The world's tallest mountains, deepest chasms and longest mountain ranges are all found beneath the sea.
19. The effect of the earth's rotation causes the ocean currents to flow in opposite directions in each hemisphere.

20. Ocean tides rise and fall due to the orbit of the moon whose gravitational pull distorts the ocean.

Chapter 3: The Earth's Fresh Water

21. The majority of the world's fresh water is in the polar ice caps and in alpine glaciers.
22. The ice sheet in Antarctica is nearly 10,000 feet (3,300 m) thick.
23. A Drainage Basin is the area of land drained by a river and its tributaries.
24. A river starts its life as a stream with a steep gradient and a low discharge. As the river flows through the Drainage Basin it becomes larger as tributaries add to the its overall discharge. Before it reaches the sea, the river meanders and has its greatest discharge.
25. Lakes will eventually fill with silt and vegetation and become a swamp. Eventually the swamp will dry out to become grasslands.

Chapter 4: The Earth's Water: Today & Tomorrow

26. Useable, fresh water is only 0.03% of all the world's water.
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