**Chapter 4: Global Climates and Biomes**

**Vocabulary**

**Module 9**

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Climate | 2. Weather | 3. Troposphere | 4. Stratosphere |
| 5. Albedo |  |  |  |

**Module 10**

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Saturation Point | 4. Latent Heat Release | 7. ITCZ | 10. Coriolis Effect |
| 2. Adiabatic Cooling | 5. Atmospheric Convection Current | 8. Polar Cell | 11. Rain Shadow |
| 3. Adiabatic Heating | 6. Hadley Cell | 9. Ferrell Cell |  |

**Module 11**

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| --- | --- | --- | --- |
| 1. Gyre | 2. Upwelling | 3. Thermohaline Circulation | 4. ENSO |

**Module 12**

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| --- | --- | --- | --- |
| 1. Terrestrial Biome | 4. Permafrost | 7. Temperate Seasonal Forest | 10. Tropical Rainforest |
| 2. Aquatic Biome | 5. Boreal Forest | 8. Woodland/ Shrubland | 11. Tropical Seasonal Forest/ Savanna |
| 3. Tundra | 6. Temperate Rainforest | 9. Temperate Grassland/ Cold Desert | 12. Subtropical Desert |

**Module 13**

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Littoral Zone | 6. Oligotrophic | 11. Mangrove Swamp | 16. Photic Zone |
| 2. Limnetic Zone | 7. Mesotrophic | 12. Intertidal Zone | 17. Aphotic Zone |
| 3. Phytoplankton | 8. Eutrophic | 13. Coral Reef | 18. Chemosynthesis |
| 4. Profundal Zone | 9. Freshwater Wetlands | 14. Coral Bleaching |  |
| 5. Benthic Zone | 10. Salt Marsh | 15. Open Ocean |  |

Growing Grapes to Make a Fine Wine

1. What areas of the world are ideal for cultivating grapes (5 main areas)?
2. What are the physical characteristics of these areas?
3. Why is climate change threatening these areas?
4. What challenges do winemakers face in the future?

Module 9: The Unequal Heating of the Earth

1. What is the difference between weather and climate? Define each one and give 2 examples of each.
2. List the 5 major processes that drive climate on Earth.
3. Fill in the chart below using Figure 9.1. You should list the ozone layer and exosphere, but can leave the temperature boxes blank.

For altitude, the number ranges in the text are more accurate than the ones in the chart.

|  |  |  |
| --- | --- | --- |
| **Layer** | **Altitude Range** | **Temperature trend as altitude increases** |
| Troposphere | 0-10 km | Decreases  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

1. What happens to the air pressure as you move from the troposphere to the exosphere?
2. What are the three main causes of uneven warming of the earth? Briefly explain each one.
3. What causes the seasons?
4. Explain how the rays of the sun hit the Earth on the following: the equinoxes, June solstice and December solstice.

Review Questions (pg 109)

1. 2. 3. 4. 5.

Module 10: Air Currents

1. **Density: (circle the correct answers)**

-Less dense air RISES/SINKS

-More dense air RISES /SINKS

-Cold air is MORE/LESS dense than warm air and thus RISES/SINKS

-Warm air is MORE/LESS dense than cold air and thus RISES/SINKS

1. **Saturation**

-Warm air holds MORE/ LESS water than cold air, so as air temperature INCREASES/DECREASES the saturation point increases.

-When air cools, the saturation point INCREASES/DECREASES resulting in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Adiabatic heating and cooling**

-When air sinks, the pressure INCREASES/ DECREASES which causes the volume to INCREASE /DECREASE which INCREASES / DECREASES the temperature. This is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 -When air rises, the pressure INCREASES/DECREASES which causes the volume to INCREASES/DECREASES which INCREASES/DECREASES the temperature. This is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. **Latent heat release**

-Going from a liquid to a gas is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_and REQUIRES/RELEASES heat energy.

 -Going from a gas to a liquid is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 REQUIRES/RELEASES heat energy.

1. Explain why there are deserts at 30 degrees N and S of the equator. Include in you explanation Hadley Cells, ITCZ, and Polar cells. Include all the steps of the Hadley Cell pathway. Refer to Figure 10.3.
2. What causes the Coriolis effect?
3. Explain why the Earth is moving faster at the equator.
4. Explain how, where, and why the rain shadow effect occurs.

Module 10 Review (pg 116)

1. 2. 3. 4. 5. 6. 7.

Module 11: Ocean Currents

1. Why are the oceans of the world an important factor for global climates?
2. What are ocean currents driven by?
3. Which way do ocean gyres typically move?
4. Describe what upwelling is. Why is it important?
5. Explain why thermohaline circulation is important. Explain the steps from figure 11.2.
6. How could climate change potentially alter thermohaline circulation?
7. What is El-Nino? When does it typically happen? Where does it happen? How are the trade winds related to El-Nino? Why do fishermen in South America suffer during an El Nino?

Module 11 Review (pg 120)

1. 2. 3. 4. 5.

Module 12: Terrestrial Biomes

| **Biome** | **Other names** | **Location** | **Climate** | **Vegetation** | **Limiting Factors/ Adaptations** | **Soil** |
| --- | --- | --- | --- | --- | --- | --- |
| *Tundra* | *Arctic Tundra* *Antarctic tundra* *Alpine tundra (top of mountains)* | *Near poles* | *Cold year round with a short summer and low rainfall year round* | *Low growing vegetation: small shrubs, mosses and lichens* | *Freezing temps, slow decomp., slow soil formation, low soil nutrients* | *Thin soil that is nutrient depleted and frozen or waterlogged* |
| Boreal Forest |  |  |  |  |  |  |
| Temperate Rain Forest |  |  |  |  |  |  |
| Temperate Seasonal Forest |  |  |  |  |  |  |
| Woodland/ Shrubland |  |  |  |  |  |  |
| Temperate Grassland/ Cold Desert |  |  |  |  |  |  |
| Tropical Rain Forest |  |  |  |  |  |  |
| Tropical Seasonal Forest/ Savanna |  |  |  |  |  |  |
| Subtropical Desert |  |  |  |  |  |  |

Module 12 Review

1. 2. 3. 4. 5.

Module 13: Aquatic Biomes

1. Which types of species tend to dominate river ecosystems?
2. How do conditions between fast-moving 'headwaters' (or sources) of rivers differ from slow-moving 'mouths' of rivers?
3. Where are the majority of producers in a lake located?
4. What separates the limnetic zone from the profundal zone in a lake?
5. Where would you expect to find the largest food webs - oligotrophic, mesotrophic, or eutrophic lakes? Explain.
6. What characteristic defines a wetlands?
7. Why are wetlands so ecologically productive, and what valuable ecosystem services do they provide to humans?
8. What is the difference between a "marine" biome and a "freshwater" biome?
9. Where are coral reefs generally found, how are they built, and why are they under heavy threat from bleaching?
10. Do the vast open oceans areas deeper than ~200 meters and away from coastlines support much life? Explain.

Module 13 Review (139)

1. 2. 3. 4. 5.