

Geographic Thermodynamics

Thermodynamics · Answer Key · 8 Questions

1. What is the primary thermodynamic process responsible for the high surface temperatures of the Danakil Depression in Ethiopia?

- A) Geothermal heating of crustal plates
- B) Adiabatic warming of descending air
- C) Radiative absorption in a low-elevation basin**
- D) Convective heat transfer from volcanic vents

2. The 'Föhn' wind, which causes rapid temperature increases in the valleys of the Swiss Alps, is a classic example of which thermodynamic process?

- A) Isothermal expansion
- B) Adiabatic compression**
- C) Isobaric contraction
- D) Latent heat vaporization

3. In the context of Earth's heat budget, what is the primary mechanism by which the tropics export excess thermal energy to the polar regions?

- A) Thermal conduction through the crust
- B) Global oceanic and atmospheric circulation**
- C) Increased planetary albedo
- D) Subsurface geothermal radiation

4. Which thermodynamic property of water is primarily responsible for the moderate climate of coastal cities like San Francisco compared to inland regions?

- A) Low thermal conductivity
- B) High specific heat capacity**
- C) High latent heat of fusion
- D) Low surface tension

5. The formation of Katabatic winds in Antarctica is driven by which thermodynamic principle?

- A) The density difference of air cooled by radiation over ice sheets**
- B) The conversion of chemical energy to kinetic energy
- C) The sublimation of surface snow
- D) The high pressure caused by volcanic activity

6. The process of 'thermal stratification' in Lake Baikal prevents water at different depths from mixing, which is primarily maintained by the relationship between temperature and what other property?

- A) Pressure
- B) Salinity
- C) Density**
- D) Surface tension

7. Why do the interiors of large continents like Eurasia experience significantly larger annual temperature ranges than coastal regions at the same latitude?

- A) Reduced atmospheric pressure over land
- B) Lower specific heat capacity of soil compared to water**
- C) Higher solar radiation absorption of vegetation
- D) Increased convection currents over mountains

8. What thermodynamic phenomenon explains why the summit of Mount Everest, despite being closer to the sun, is much colder than the sea-level tropics?

- A) The second law of thermodynamics
- B) The adiabatic lapse rate in the troposphere**
- C) Decreased solar flux due to latitude
- D) The greenhouse effect being absent at high altitudes