1. (4%) Soil is the product of rock weathering and provides nutrients and habitats for life. Which is NOT the main controlling factor of soil formation?
   A. Microbial abundance
   B. Altitude
   C. Precipitation
   D. Distance from the ocean

2. (4%) Which is NOT the main principle of topographic maps?
   A. Cause of topographic formation
   B. Land use
   C. Topographic hierarch
   D. Age of formation

3. (6%) Arrange the soil layers starting from the land surface.
   A. Eluviation layer
   B. Organic layer
   C. Subsoil
   D. Topsoil
   E. Parent material

4. (4%) Which is the Best to explain the global distribution of volcanic activity?
   A. Volcanic activity is randomly distributed across the Earth's surface without relation to tectonic processes.
   B. Volcanic activity is concentrated at tectonic plate boundaries and hotspots, influenced by magma generation and plate movements.
   C. Volcanic activity occurs in continental regions, with no significant activity under the oceans.
   D. Volcanic activity is uniformly distributed across the Earth's crust.

5. (4%) Which is the Best to explain the relationship between Milankovitch cycles and Earth's water cycle?
   A. Milankovitch cycles have no significant impact on Earth's water cycle, as they affect atmospheric conditions.
   B. Milankovitch cycles influence Earth's water cycle by driving long-term climate changes, altering ice volume, sea levels, and precipitation patterns.
   C. Milankovitch cycles directly control the evaporation rate of water globally, determining seasonal rainfall.
   D. Milankovitch cycles are unrelated to the water cycle and affect Earth's magnetic field.

6. (4%) Determine whether the following statement is True or False and describe your reasons.
   Transport-limited sediment transport occurs when the sediment supply exceeds the ability of the flow to transport it, while supply-limited sediment transport occurs when the flow's ability to transport sediment exceeds the available sediment supply.

7. (4%) Determine whether the following statement is True or False and describe your reasons.
   Erosion and denudation both involve the breakdown and removal of Earth's surface materials, but erosion specifically refers to the transport of material, while denudation includes all processes that lower the land surface, including weathering and mass wasting.

8. (10%) Does the Taroko (太魯閣) Gorge belong to a limestone landform? Explain your reasons.

9. (10%) Explain the relationship between the global distribution of deltas (三角洲) and the ice age.

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10. (20%) **Influence of Land Use Changes on Surface Energy Balance**

In recent years, land use changes have significantly influenced the surface energy balance, such as deforestation being replaced by farmland or urban development. These changes affect surface albedo, latent heat flux, sensible heat flux, and long-wave radiation. For example, forested areas typically have low surface albedo, allowing them to absorb more short-wave solar radiation. Additionally, due to vegetation transpiration, latent heat flux is relatively high. However, when forests are removed and replaced with farmland or cities, surface albedo may increase, latent heat flux decreases, and sensible heat flux and surface temperatures rise. In urban areas, construction materials with high long-wave emissivity further alter the energy balance, potentially contributing to urban heat island effects. Based on the above context, please **briefly** answer the following questions:

(1) (5%) When a forest is converted into farmland, how does the change in surface albedo affect the surface energy balance? Explain from the perspective of short-wave radiation absorption.

(2) (5%) Compare the differences in latent heat flux and sensible heat flux between forests and urban areas, and explain how these differences impact local climatic conditions.

(3) (5%) In urban environments, building materials tend to have high long-wave emissivity. Briefly explain how this characteristic affects nighttime surface energy balance and temperature changes.

(4) (5%) Imagine a forested area being converted into an urban area. How might the long-term changes in energy balance affect the local water cycle and ecosystem? Provide one specific example to illustrate.

11. (20%) **Impact of Urbanization on Watershed Hydrological Processes**

With the rapid development of urbanization, significant changes have occurred in watershed hydrological processes. The increase in impervious surfaces, such as roads, buildings, and parking lots, alters rainfall runoff patterns and the groundwater recharge process. Urbanization typically leads to increased surface runoff, reduced rainfall infiltration, and shorter times for runoff to reach river channels. Additionally, the pollution load in water bodies increases with the construction of urban drainage systems. These changes may result in increased flood risks and water quality deterioration, impacting local ecosystems and socio-economic activities. During the process abovementioned, some phenomena are likely to occur. Determine whether each of the following statements are True or False. **Briefly** describe your reasons for your answer.

A. (4%) Significant increase in surface runoff volume

B. (4%) Significant increase in groundwater recharge rate

C. (4%) Increased peak flow in rivers and earlier peak times

D. (4%) Significant increase in evaporation within the watershed

E. (4%) Increased concentration of pollutants in water bodies

12. (10%) **Biogeography and Climatology Interaction**

As global climate change continues to impact ecosystems, the functionality and services provided by ecosystems are increasingly under threat. For instance, rising temperatures and altered precipitation patterns not only shift species distributions but also affect ecosystem services such as carbon storage, water regulation, and soil conservation. Moreover, climate change creates favorable conditions for the invasion of non-native species, which may have higher adaptability compared to native species. These invasive species can outcompete native species, destabilizing local ecosystems. For example, certain heat-tolerant invasive plants may replace native vegetation, altering local water cycles and carbon sequestration capabilities. These changes can also have far-reaching consequences for human societies that rely on ecosystem services.

(1) (5%) "Climate change enhances the ability of invasive species to spread, and the increase in invasive species always negatively impacts local ecosystems."
Please determine whether this statement is True or False and **briefly** explain your reason.

(2) (5%) How might invasive species impact ecosystem services? Please **briefly** describe one component in ecosystem services mechanisms and provide a quick example to illustrate your answer.

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