

2023 USGC Nationals Cartographic Examination - Key and Marking Scheme

Section 1 [25 marks]

Expected answers:

- [4 marks] 3; an amphitheatre-like valley formed by glacial erosion, Cirques form in conditions which are favorable; in the Northern Hemisphere the conditions include the north-east slope, where they are protected from the majority of the Sun's energy and from the prevailing winds. These areas are sheltered from heat, encouraging the accumulation of snow; if the accumulation of snow increases, the snow turns into glacial ice.
- [4 marks] 4; a narrow ridge of rock which separates two valleys. It is typically formed when two glaciers erode parallel U-shaped valleys. Arêtes can also form when two glacial cirques erode headwards towards one another, although frequently this results in a saddle-shaped pass, called a col. The edge is then sharpened by freeze-thaw weathering, and the slope on either side of the arête steepened through mass wasting events and the erosion of exposed, unstable rock.
- [4 marks] 1; any accumulation of unconsolidated debris (regolith and rock), sometimes referred to as glacial till, that occurs in both currently and formerly glaciated regions, and that has been previously carried along by a glacier or ice sheet. It may consist of partly rounded particles ranging in size from boulders (in which case it is often referred to as boulder clay) down to gravel and sand, in a groundmass of finely-divided clayey material sometimes called glacial flour. Lateral moraines are those formed at the side of the ice flow, and terminal moraines were formed at the foot, marking the maximum advance of the glacier.
- [4 marks] 2; sometimes called a glacial horn in extreme cases, is an angular, sharply pointed mountain peak which results from the cirque erosion due to multiple glaciers diverging from a central point. Pyramidal peaks are often examples of nunataks, when three or more of these cirques converge on a central point, they create a pyramid-shaped peak with steep walls. These horns are a common shape for mountain tops in highly glaciated areas. The number of faces of a horn depends on the number of cirques involved in the formation of the peak
- [4 marks] accept any answer that evidences the relationship between the sediments in the glaciers and the coloration of the water
- [1 mark per answer] fjord – erosional; esker – depositional; kame – depositional; outwash fan – depositional; u-shaped valley – erosional

Section 2 [25 marks]

Expected answers:

- [2 marks] the process of drawing electoral district boundaries. For the United States House of Representatives, and state legislatures, redistricting occurs after each decennial census.
- [2 marks per answer] packing - is concentrating many voters of one type into a single electoral district to reduce their influence in other districts. In some cases, this may be done to obtain representation for a community of common interest (such as to create a majority-minority district), rather than to dilute that interest over several districts to a point of ineffectiveness (and, when minority groups are involved, to avoid lawsuits charging racial discrimination); cracking - involves spreading voters of a particular type among many districts in order to deny them a sufficiently large voting bloc in any particular district. Political parties in charge of redrawing district lines may create more "cracked" districts as a means of retaining, and possibly even expanding, their legislative power

Section 2 (continued)

3. [4 marks] see above
4. [3 marks] The new districts crack the concentration of Democratic voters in Nashville and cram them into three districts that stretch across the state and are filled with reliable Republican voters. The proposed plan would clearly diminish the influence of Black voters and other voters of color concentrated in Nashville, inserting them into districts that are overwhelmingly white and Republican. About a quarter of the eligible voting population in the fifth congressional district is Black. Under the new lines, Black voters would make up about 14% of the new fifth district and about 17% and 10% of the other two new districts in the city.
5. [4 marks] Contiguity refers to the principle that all areas within a district should be physically adjacent; the 6th district is fairly contiguous, the others are much less so [students should go into some detail based on the map]
6. [4 marks] Compactness refers to the general principle that the constituents within a district should live as near to one another as practicable; none of these districts score particularly highly for compactness [students should go into some detail based on the map]
7. [4 marks] A community of interest is defined by FairVote as a "group of people in a geographical area, such as a specific region or neighborhood, who have common political, social or economic interests."

Section 3 [25 marks]

Expected answers:

1. [1 mark per answer] intercity bus – 2, medium-sized gas-powered automobile – 4, a domestic flight within the UK – 6, long-haul international flight – 5, intercity train – 3, international train – 1
2. [4 marks] answers will vary but should include factors like relative efficiency of the mode of transportation, number of riders / passengers, length, etc. [accept reasonable answers and award partial credit]
3. [1 mark per answer] US and China; factors may include size of country, lack of well-developed rail system in many areas, economic prosperity, number of short and long-haul flights [accept other reasonable answers]
4. [1 mark per answer] Nitrogen oxides (NO_x, nitric oxide and nitrogen dioxide); contrails and cirrus clouds; Particulates
5. [3 marks] A first class ticket on a long-haul flight emits, on average, four times as much as an economy seat on the same plane, as the chart below shows. This is because more expensive seats take up more space and weight on the plane. First and business class also tend to end up with more empty seats.
6. [1 mark per answer] Sustainable aviation fuels; "revolutionary" designs, such as new airframe configurations; Battery electric propulsion [accept other reasonable answers]
7. [1 mark per answer] regulatory frameworks, tax incentives for sustainable fuel and designs, carbon offset taxes [accept other reasonable answers]

Section 4 [25 marks]

Expected answers:

1. [2 marks per answer] Atmospheric rivers are ribbons of moisture carried by strong winds in the lower atmosphere; Engines of the global water cycle, atmospheric rivers carry vast amounts of moisture from the tropics to the poles—accounting for 90% of the total water vapor that moves across Earth’s mid-latitudes, where the U.S. is located.
2. [3 marks] California’s drought coverage dropped from 98% in December 2022 to 36% in March 2023 as a series of at least 12 atmospheric rivers hit the West Coast. This marks the first time since 2020 that none of California was in exceptional or extreme drought. Drought conditions have also improved across the entire West—parts of which had been experiencing exceptionally severe and prolonged drought since 2000. Drought conditions are expected to continue to improve through the spring of 2023 as record snowpack melts and tops up reservoirs. [other reasonable answers accepted]
3. [6 marks] risk of wildfires along the western coast is likely to increase for residents moving into the dry season. Because of the recent storms, much of the vegetation that had stunted growth over the last few years due to extreme drought has been replenished and can become a fire risk by serving as fuel; Strong winds ripped trees from their roots and tore down branches, littering ignition opportunities throughout high-risk areas; The deluges also washed out winter plans for prescribed burning [other reasonable answers accepted]
3. [6 marks] there is an increased risk of so-called compound events; Wildfire burn scars are particularly risky because wildfires strip away vegetation and make the soil hydrophobic—meaning it is less able to absorb water. A downpour on these vulnerable landscapes can quickly erode the ground, and fast-moving water can carry the debris, rocks and mud with it; ground affected by drought is also more susceptible to wildfires as well when heavy rains occur [accept other reasonable answers]
4. [6 marks] extreme weather events cause supersaturation of the soil which causes mudslides and increased erosion; increased wave action that sweeps sediment and sand out to sea [accept other reasonable answers]