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FRQ Practice 4.1

SUGGESTED SKILL

 *Visual Representations*

2.C

Explain how environmental concepts and processes represented visually relate to broader environmental issues.

Explain how subduction leads to volcanic activity.

(ii) Explain how subduction leads to volcanic activity.


(2 points: 1 point for a correct explanation of one plate being pushed down and melted and 1 point for a correct explanation of molten material/magma rising to the surface near the zone)

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FRQ Practice 4.2

SUGGESTED SKILL

 *Scientific Experiments*

4.B

Identify a research method, design, and/or measure used.

Design an investigation to measure the effect that climate has on soil formation.

Identify the independent variable and dependent variable in your experiment

Describe (1 pt.)

- **Soil from three or more different climates should be collected and measured to determine some aspect of soil formation (horizon depths, rate of formation, erosion, organic matter)**

Identify (1 pt.) must identify both correctly

- **Independent - a specific climate factor such as temperature, precipitation, insolation/sunlight, length of growing season**
- **Dependent - rate of top soil formation, rate of soil erosion, rate of biomass decomposition, depth of (O/A/B horizon)**

FRQ Practice 4.3 (pt. 1)

SUGGESTED SKILL

 Scientific Experiments

Identify and **describe** one test that can be conducted on a soil sample.

Identify & Describe (1 pt.)

- pH -- Measures the acidity or alkalinity or hydrogen ion concentration
- Salinity (salinization) -- Measures salt content of soil
- Organic content (humus) -- Analysis that indicates organic content
- Ion exchange capacity -- Measures ability to absorb and release cations, especially plant nutrients

On the following chemical tests the name is a sufficient descriptor of the test. (Symbols for the elements are acceptable.)

- ◆ Major elements
- ◆ Measures the amount of nitrogen, phosphorus, potassium, or sulfur in any form
- ◆ Trace elements
- ◆ Measures the amount of iron, cobalt, boron, calcium, magnesium, manganese, selenium, aluminum, mercury, etc.

Soil Texture Ribbon test (ped test) Soil sieve test (nested sieves) Composition/make-up Sedimentation Hydrometer method Particle-size analysis	Percent/proportion of sand, silt, and clay-sized particles that make up the solid inorganic phase of soil
Water-holding capacity Porosity	Amount of water the soil can hold due to amount of pore or air space
Moisture content	Amount of water in the soil at a given time
Particle density or bulk density	How much a particular soil weighs per unit volume
Soil Structure (friability) Colloids and aggregates	How soil is held together forming small clumps of various types

Percolation rate Soil drainage Infiltration Permeability	Speed of infiltration of water into soil
Capillarity of soil	Movement of water against the pull of gravity
Soil compaction	Degree to which soil resists pressure from wind, water, and machinery
Soil profile analysis	Determines the nature of the soil horizons (structure, depth, color – does <u>not</u> indicate texture)
Color	Indicates soil components or properties (e.g., iron, amount of humus, level of water table)

4.C

Describe an aspect of a research method, design, and/or measure used.

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FRQ Practice 4.3 (pt. 2)

SUGGESTED SKILL

 *Scientific Experiments*

4.C

Describe an aspect of a research method, design, and/or measure used.

Explain how the results of the test could allow you to give advice to a farmer trying to grow crops in the soil.

Explain (1 pt.)


- Indicating suitable crops and cultivation practices
- Adding soil additives such as sand, clay, or humus to affect ion-exchange capacity as well as moisture content and water-holding capacity
- Applying lime for acid soil; applying sulfur for alkaline (basic) soil to neutralize
- Planting leguminous crops to increase nitrogen, or apply manure
- Liming or applying bone meal to improve phosphorus
- Burning crop residue to increase potassium
- Examining irrigation practices to combat salinity, erosion, and excessive water usage
- Adding lime or limestone to increase calcium and magnesium
- Applying gypsum or green sand to increase the sulfur content and water-holding capacity
- Adding organic matter (animal manure, green manure, or crop residues) to improve many of the soil's physical and chemical properties
- Increasing soil fertility by using other practices such as grassed waterways and no-till crop rotation
- Reducing the use of inorganic fertilizers
- Decreasing agricultural soil erosion by using Best Management Practices (BMP)

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FRQ Practice 4.4

SUGGESTED SKILL

 *Visual Representations*

2.A

Describe characteristics of an environmental concept, process, or model represented visually.

Identify a layer of earth from the diagram that has an inverse relationship between temperature and altitude. **Describe** why this occurs. (2 pts.)

ID (1 pt.)	Describe (1 pt.)
(A) Troposphere	Higher altitudes of troposphere are further away from the heat/infrared radiation released by earth's surface
(C) Mesosphere	Temperature decreases with altitude in mesosphere as molecular density decreases, reducing the heat absorbed by the sun at higher altitudes

FRQ Practice 4.5

Explain how the sun is responsible for the pattern of air circulation seen in cycle C. (1 pt.)

Explain (1 pt.)

- **The sun's rays strike the earth most directly at the equator, heating air more than nearby latitudes, causing it to rise. Air expands and cools as it rises, eventually sinking back down earth's surface near 30 degrees N & S**

SUGGESTED SKILL



Visual Representations

2.B

Explain relationships between different characteristics of environmental concepts, processes, or models represented visually:

- In theoretical contexts
- In applied contexts

FRQ Practice 4.6

SUGGESTED SKILL

 *Concept Explanation*

1.C

Explain environmental concepts, processes, or models in applied contexts.

Deforestation can affect water quality. **Identify** one change that can occur in the water quality of streams within a watershed that has been deforested. **Explain** how deforestation can lead to this change. (2 pts.)


Change in Water Quality	Linkage to Deforestation
Increase in water temperature	Loss of shade; increased solar radiation reaching the stream
Increase in sediment/turbidity	Loss of root structure, leaf litter, canopy leads to increased soil erosion and runoff
Increase in nutrient concentration	Loss of vegetation results in less nutrient uptake and subsequent runoff into stream
Decrease in pH	Loss of root structure allows naturally-occurring acids to run off into streams
Decrease in dissolved oxygen	Loss of shade leads to warmer water, which holds less dissolved oxygen

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FRQ Practice 4.7

SUGGESTED SKILL

 *Visual Representations*

2.A

Describe characteristics of an environmental concept, process, or model represented visually.

Identify which season is taking place in the Northern hemisphere in this diagram.
Describe how the tilt of the earth's axis is responsible for earth's seasons. (2 pts.)

Identify (1 pt.)

- **Winter**

Describe (1 pt.)

- **As earth orbits the sun, it is tilted on its axis, resulting in either the northern or southern hemispheres being tilted closer to the sun and receiving more solar radiation at various points in the year/orbit**
- **An acceptable description of why summer is occurring in the northern hemisphere in this diagram (or winter in the southern hemisphere) should also earn a point**


FRQ Practice 4.8

Describe the regional precipitation pattern you would expect for the portion of Mexico & central America indicated on the map. **Justify** your answer. (2 pts.)

Describe (1 pt.)

- The southern portion of the region would be expected to have lower annual/average precipitation than the northern region
- The eastern region/shore of the Gulf of Mexico would be expected to have higher annual/average precipitation than the western region/pacific coast

SUGGESTED SKILL

 *Visual Representations*

2.C

Explain how environmental concepts and processes represented visually relate to broader environmental issues.

FRQ Practice 4.8

SUGGESTED SKILL

 *Visual Representations*

2.C

Explain how environmental concepts and processes represented visually relate to broader environmental issues.


Describe the regional precipitation pattern you would expect for the portion of Mexico & central America indicated on the map. **Justify** your answer. (2 pts.)

Justification (1 pt.) must match description

- **Southern-Northern**
 - **Northern areas of this region are further from the equator and receive less rainfall as they're closer to the dry, high pressure conditions of 30 degrees N**
 - **Southern areas of this region are closer to the equator and receive more rainfall because the sun's rays strike the equator most directly, heating air and causing it to rise. As air rises, it expands and cools, decreasing its water holding capacity which results in precipitation**
- **Eastern-Western**
 - **Because wind patterns in this region move from east to west, eastern regions receive more rainfall as prevailing winds carry moisture from the Atlantic Ocean/Gulf of Mexico which condenses and falls as precipitation when air reaches land**

FRQ Practice 4.9

SUGGESTED SKILL

 Environmental Solutions

7.A

Describe environmental problems.

Describe TWO environmental problems related to the conditions of an El nino event.
(2 pt.s)

ENSO may cause	Problems (e.g.)	Effects (e.g.)
Warming water (primarily ocean)	Habitat destruction Increased algal blooms Coral bleaching Disruption of migration No upwelling of nutrient-rich waters Die-off of species that cannot tolerate the warmth Lowered water-solubility of CO ₂ gas Increased storms/shift of zones where storms form	Starvation/die-off of species Loss of food for higher trophic levels Disruption of food webs Loss of biodiversity
Movement of warm ocean waters/increasing depth of warm surface water	Depression of thermocline Suppression of upwelling Disruption of migration Destruction of habitat	Nutrient-rich waters not available for fish Loss of food Starvation/die-off of species
Increased rainfall	Flooding Mudslides Erosion Nutrient leaching	Habitat destruction Plants unable to grow/loss of food production
Decreased rainfall	Drought/lack of water for living organisms Increased risk of fires Less plant growth	Starvation/die-offs Habitat destruction Starvation/die-offs

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FRQ Practice 4.9

Describe TWO environmental problems related to the conditions of an El nino event.
(2 pts.)

SUGGESTED SKILL

 *Environmental Solutions*

7.A

Describe environmental problems.

ENSO may cause	Problems (e.g.)	Effects (e.g.)
Increased land temperature	Species unable to adapt Drought	Habitat destruction Starvation/die-offs
Changes in ocean currents	Disruption of migration	Disruption of food webs
Flooding	Loss of habitat Contaminated water supplies Nutrient leaching from soils	Species die-offs Reduced potable water Poor/no plant growth
Drought	Increased risk of fires Lack of water for living organisms Decreased food production	Habitat destruction Decreased food Starvation/die-offs
Increased storms (number, frequency, or strength)	Flooding Increased coastal erosion by waves	Habitat destruction

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