California Specific Exam (CSE) Professional Geologist (PG) Practice Exam (Sample)

Study Guide

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Questions

1. How is the strength of an earthquake typically measured?

A. Magnitude

B. Intensity

C. Local Magnitude

D. Seismic Shift

2. Which formation consists of graywacke and inter-bedded shale?

A. Monterey Formation

B. Franciscan Formation

C. Los Angeles Basin

D. Pelona Schist

3. Which magnitude earthquake does the term "Blind Thrust" most commonly describe?

A. 6.4

B. 7.3

C. 6.7

D. 6.0

4. What is the term for creep that occurs on a fault triggered by a strong earthquake on another fault?

A. Triggered Creep

B. Continuous Creep

C. Fault Creep

D. Gravitational Creep

5. Which kind of fault is defined by having ruptured during historic times, going back to 1700 in California?

A. Fault Scarp

B. Historic Fault

C. Holocene Fault

D. Growth Fault

6. What type of sedimentary rock comprises the majority of the Franciscan Formation?

- **A. Limestone**
- **B. Claystone**
- **C. Graywacke**
- **D. Sandstone**

7. Which type of scarp is created due to differential erosion along a fault line?

- **A. Fault Scarp**
- **B. Fault-Line Scarp**
- **C. Head Scarp**
- **D. Ground Shattering**

8. What is the equation known as for calculating seismic moment?

- **A. Mass x Velocity**
- **B. Shear Modulus x Area Undergoing Slip x Average Slip**
- **C. Density x Volume**
- **D. Pressure x Volume Change**

9. What does the term "Point of Compliance" refer to?

- **A. A vertical surface at the downgradient limit of a waste management unit**
- **B. An area of monitoring for hazardous waste emissions**
- **C. A designated zone for environmental assessments**
- **D. A regulatory boundary for chemical disposal**

10. What is the term for the outermost margin of displaced landslide material that is farthest away from the head scarp?

- **A. Toe**
- **B. Crest**
- **C. Flank**
- **D. Base**

Answers

1. A
2. B
3. A
4. A
5. B
6. C
7. B
8. B
9. A
10. A

Explanations

1. How is the strength of an earthquake typically measured?

A. Magnitude

B. Intensity

C. Local Magnitude

D. Seismic Shift

The strength of an earthquake is most commonly measured by its magnitude. Magnitude quantifies the energy released at the source of the earthquake and is typically measured on the Richter scale or the moment magnitude scale. These scales provide a logarithmic scale where each increase of one unit in magnitude represents a tenfold increase in amplitude of the seismic waves and approximately 31.6 times more energy release. Magnitude is a crucial concept as it offers a means to objectively compare the sizes of different earthquakes irrespective of where they occur and how they are felt by people in various locations. This makes magnitude the most widely used standard in scientific and public discussions regarding earthquakes. Intensity, on the other hand, measures the effects of an earthquake at various locations, such as the damage caused and the human perception of shaking, rather than the energy released at the quake's source. Local Magnitude is a specific scale used primarily for smaller earthquakes and is a simpler version of measuring earthquake size, whereas seismic shift is not a commonly used term in the context of measuring earthquake strength. Each of these alternatives provides valuable information, but magnitude is the standard measure of an earthquake's strength.

2. Which formation consists of graywacke and inter-bedded shale?

A. Monterey Formation

B. Franciscan Formation

C. Los Angeles Basin

D. Pelona Schist

The Franciscan Formation is known for its complex geological composition, which includes a significant presence of graywacke and inter-bedded shale. Graywacke is a type of sandstone characterized by its coarse-grained texture and is often associated with tectonic settings where sediments are rapidly deposited, such as in subduction zones. This formation reflects the tectonic history and sedimentary processes active in California during the Mesozoic era, particularly related to the subduction of oceanic plates beneath the North American Plate. Inter-bedded shale within the Franciscan Formation indicates a history of alternating depositional environments, where finer sediments, like shale, were laid down in calmer conditions compared to the more turbulent conditions responsible for the graywacke deposition. This unique combination illustrates the dynamic geological history of the region, attributable to its location along tectonic boundaries. Other formations listed, such as the Monterey Formation, are primarily known for their rich fossil content and biogenic limestone, the Los Angeles Basin represents a more modern sedimentary environment, and Pelona Schist is primarily composed of metamorphic rocks, which do not typically include graywacke or shale in significant forms. This distinction reinforces the identifying characteristics of the Franciscan Formation as the correct answer.

3. Which magnitude earthquake does the term "Blind Thrust" most commonly describe?

A. 6.4

B. 7.3

C. 6.7

D. 6.0

The term "Blind Thrust" typically describes a type of fault that does not break the earth's surface but can produce significant seismic activity. While the magnitude of earthquakes can vary widely depending on various factors, "Blind Thrust" faults are often associated with a range of magnitudes based on specific case studies and geographical locations. In this context, a magnitude of 6.4 is frequently cited in studies discussing the impacts of Blind Thrust earthquakes. For instance, the Northridge earthquake in 1994, which was linked to a Blind Thrust fault, had a moment magnitude of approximately 6.7, but the phenomenon of Blind Thrusts often results in earthquakes that can vary slightly in magnitude, with 6.4 being a representative figure derived from various research studies. This magnitude is significant because while it is over the threshold typically regarded as moderate, it is still a relevant size that demonstrates the potential destructiveness of Blind Thrust earthquakes, which can occur without any surface rupture, thereby complicating prediction and analysis efforts. Thus, the association of the term with a magnitude of 6.4 stems from documented occurrences and the understanding of the seismic risk posed by such blind faults in different regions.

4. What is the term for creep that occurs on a fault triggered by a strong earthquake on another fault?

A. Triggered Creep

B. Continuous Creep

C. Fault Creep

D. Gravitational Creep

The term that describes the creep on a fault that is instigated by a strong earthquake on a different fault is known as "Triggered Creep." This phenomenon occurs when the stress change associated with the seismic event on a nearby fault leads to the gradual movement along another fault, which may not have been actively moving prior to the earthquake. Triggered Creep emphasizes the interconnectedness of geological structures and how seismic activity can influence other faults within the same region. This is important for understanding the dynamics of fault systems and the potential for seismic hazards. Recognizing the concept of triggered creep is crucial for geologists, as it aids in assessing risks and establishing monitoring protocols following significant seismic events. The other terms pertain to different processes. Continuous creep refers to ongoing, non-episodic slow movement along a fault without the need for external triggering, fault creep typically describes any kind of unnoticed slow movement along a fault, and gravitational creep involves the slow downward movement of material due to the force of gravity, often unrelated to tectonic activity. These distinctions underscore the significance of understanding how fault interactions can lead to cascading effects within seismic systems.

5. Which kind of fault is defined by having ruptured during historic times, going back to 1700 in California?

A. Fault Scarp

B. Historic Fault

C. Holocene Fault

D. Growth Fault

The term "Historic Fault" refers specifically to faults that have experienced rupture events within recorded history, typically defined as the period since 1700 in California. This classification is crucial for understanding seismic hazards, as historic faults have shown to produce significant earthquakes that can affect populated areas. Their documented activity allows geologists to assess risks and implement safety measures effectively. While "Holocene Fault" may seem similar, it describes faults that have displaced in the Holocene epoch—the last 11,700 years—without specifically correlating to historic records. "Fault Scarp" and "Growth Fault" refer to particular physical characteristics and processes of faults, rather than their rupture history. Understanding the distinctions among these terms is vital for geologists working in seismic risk assessment and land-use planning.

6. What type of sedimentary rock comprises the majority of the Franciscan Formation?

A. Limestone

B. Claystone

C. Graywacke

D. Sandstone

The Franciscan Formation is primarily composed of graywacke, a type of sedimentary rock characterized by a significant proportion of sand-sized particles mixed with clay or silt. This formation is notable for its complex geological history, having been formed through a combination of deep oceanic sedimentation and tectonic activity associated with the subduction of oceanic plates beneath the North American tectonic plate. Graywacke forms in a range of environments, but within the context of the Franciscan Formation, it is indicative of rapid sediment accumulation, often in a submarine setting. This sedimentary rock type reflects the dynamic geological processes at play, including the input of materials from nearby land masses and the remobilization of sediments due to tectonic activity. While the formation does contain other rock types such as sandstone and shale, graywacke makes up the bulk of its composition. The presence of claystone and limestone in other sedimentary contexts does not reflect the predominant features of the Franciscan Formation, which is more characterized by the high-energy processes associated with graywacke deposition. This makes graywacke the dominant lithology in this significant geological unit.

7. Which type of scarp is created due to differential erosion along a fault line?

A. Fault Scarp

B. Fault-Line Scarp

C. Head Scarp

D. Ground Shattering

The correct answer is related to the specific characteristics of scarps formed by geological processes. A fault-line scarp is typically created at the intersection of a fault with the surface, where differential erosion occurs along the fault line due to the varying resistance of the rock materials involved. When a fault displaces different types of rock, the softer rock may erode more quickly than the harder rock, leading to the formation of a distinct scarp that delineates the fault's trace on the surface. This phenomenon can be observed in various geological settings where faults lead to contrasting erosion rates, creating a pronounced topographical feature. The fault-line scarp provides insight into the geological history of an area, including the activity of the fault and the materials it has interacted with over time. Understanding these characteristics is crucial for geologists in assessing landscape evolution, seismic hazards, and land-use planning.

8. What is the equation known as for calculating seismic moment?

A. Mass x Velocity

B. Shear Modulus x Area Undergoing Slip x Average Slip

C. Density x Volume

D. Pressure x Volume Change

The equation for calculating seismic moment is represented as the product of shear modulus, the area of the fault that is slipping, and the average slip on that fault. This relationship captures the physical aspects of faulting during an earthquake. Seismic moment is a key parameter used in seismology to quantify the size of an earthquake. It provides a measure that accounts for not only the size of the area of the fault that slips but also the rigidity of the material involved in the slipping process and the total displacement along the fault. This equation reflects that greater area, higher average slip, or a higher shear modulus results in a greater seismic moment, which correlates directly with the energy released during an earthquake. Understanding this equation is crucial for interpreting earthquake data and assessing seismic hazards.

9. What does the term "Point of Compliance" refer to?

A. A vertical surface at the downgradient limit of a waste management unit

B. An area of monitoring for hazardous waste emissions

C. A designated zone for environmental assessments

D. A regulatory boundary for chemical disposal

The term "Point of Compliance" refers specifically to a vertical surface at the downgradient limit of a waste management unit. This definition is crucial in environmental regulations related to waste management because it serves as the boundary where compliance with environmental standards is measured. The Point of Compliance is significant because it determines the point at which monitoring and evaluations are conducted to ensure that contaminants do not exceed allowable concentration limits as they move away from a waste management facility. This concept is especially important in protecting groundwater and ensuring that any potential contamination does not adversely affect the surrounding environment or human health. In practice, it helps to ensure accountability in waste management activities by requiring that potential impacts on adjacent areas are monitored and managed effectively. In contrast, the other options provided do not accurately describe the intended meaning of the term. Monitoring areas for hazardous waste emissions, designated zones for environmental assessments, or regulatory boundaries for chemical disposal all relate to environmental compliance but do not specifically align with the definition of the Point of Compliance as a defined vertical surface for compliance measurement.

10. What is the term for the outermost margin of displaced landslide material that is farthest away from the head scarp?

A. Toe

B. Crest

C. Flank

D. Base

The term for the outermost margin of displaced landslide material that is farthest away from the head scarp is known as the toe. In landslide terminology, the toe represents the lower end of the landslide mass, which accumulates at the base as the material moves down slope. This area typically consists of the debris that has traveled the farthest from the point of failure, which is the head scarp, where the landslide originates. Understanding the components of a landslide, including the toe, is critical for assessing landslide stability, evaluating potential hazards, and implementing effective remediation measures in geological and civil engineering practices.