

ENVIRONMENTAL GEOLOGY (GEOLOGY 102)

BY SHAAS N HAMDAN

TEST BANK | MIDTERM EXAM



MIDTERM EXAM

CHAPTER THREE PLATE TECTONICS THEORY

Shaas N Hamdan

Q1: Fill in the space to complete the following sentences

1. At high T rocks tend to behave _____
2. A plot of the positions of Earth's magnetic poles over time reveals a pattern referred to as _____
3. The age of the Hawaiian islands decreases _____ the Big Island of Hawaii
4. _____ is the area at the surface that characterized by high heat flow & high volcanic activity
5. _____ is the force applied on object & _____ is the deformation resulting from stress

Q2: answer the following questions as True (T) or False (F)

1. In the rocks fault are produced by plastic deformation
2. Ductile behavior characterized most of surface rocks
3. Rocks are stronger under tension than compression
4. Deeper earthquakes occur frequently under tranche
5. Divergent boundary is characteristic by normal faults
6. The elastic deformation occur in which the materials returns to original size & shape after removal of stress
7. A transform fault is a type of strike-slip fault & reflects stresses acting Vertically
8. The rock in the continental crust are rich in ferromagnesian minerals
9. In rock folds are produced by ductile deformation
10. Sediments ages & thickness decreases with increasing distance from mid oceanic ridges (MORs)
11. The lithosphere consists of both crustal rocks & a portion of the upper mantle
12. To explain continental drift, Wegener proposed that the continents broke through the oceanic crust, much like ice breakers cut through ice
13. The supercontinent of Pangaea began breaking apart about 200 million years ago
14. Lithospheric plates are thickest in the ocean basins
15. Alfred Wegener proposed the Plate Tectonic Theory to explain the motion of the continents
16. Transform faults can join two segments of a MORs
17. Seafloor spreading result of ocean-ocean convergence
18. The rate of plate movement is measured in Km/yr unit
19. Unequal distribution of heat inside Earth generates thermal convection in the crust that drives plate motion

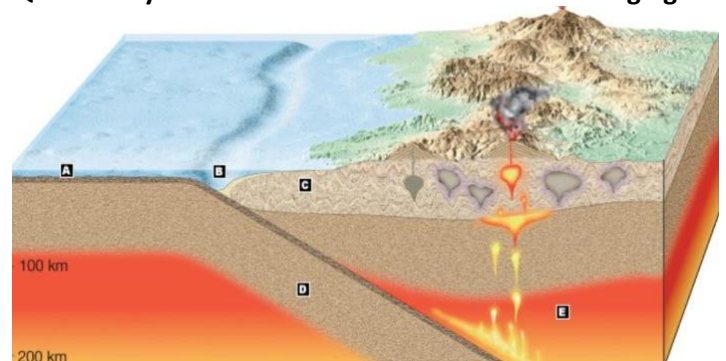
Q3: Answer the following questions briefly

1. How mantel plumes & hotspot activities can monitor the rates & direction of a plate movement
2. What is the mechanism for plate motion?
3. Observations that leads to existence of continental drift
4. Observations that leads to existence of plate tectonics
5. Continental drift hypothesis was rejected, Why?
6. Strain may be temporary or permanent depending on
7. What are the steps of contental rifting?
8. Rates & directions of plate movement determined by?
9. How we are locating the plate boundaries?
10. The activities that may occurs at subduction zones?
11. Scientific explanation for the Himalayas & Appalachian?
12. The mid-oceanic ridges arn't straight. Why?
13. The layers below the asthenosphere appear to be more rigid & elastic than the asthenosphere. Why?
14. What are the types of stress?
15. What is the types of deformation that may occurs?
16. What is the types of materials within the earth?
17. How can the Plate Tectonics leads to precipitation of valuable deposits in the oceanic crust?
18. The continental rifting process are initiated by what?
19. Materials respond differently to given stresses. Why?
20. The asthenosphere makes the continental drift more plausible. How?

Q4: Defined briefly the following terms

1. Polar wandering curve
2. Continental Drift Hypothesis
3. Seafloor spreading
4. Mid oceanic ridge
5. North African Rift system
6. Subduction zone

Q5: Identify the features illustrated in the following figure



Q6: Choice the correct answer in the following sentences

1. MORs represent regions where lithospheric plates are
A. sliding past each other B. Spreading apart
C. Colliding D. Non of the above
2. Transform faults are associated with
A. Divergent Boundary B. Convergent Boundary
C. Subduction Zone D. Hot Spot & Plume
3. Continental Volcanic Arcs is formed at
A. Oceanic-Continental Convergence Boundaries
B. Continental-Continental Divergence Boundaries
C. Oceanic-Oceanic Convergence Boundaries
4. Which of the following is not evidence used by Wegener in support of continental drift hypothesis
A. Paleoclimate B. Paleofossils
C. Rock structural Similarity D. Earth Layers thickness
5. The east African Rift zone is an example of
A. Convergent Boundary B. Subduction Zone
C. Divergent Boundary D. Hot Spot
6. The oldest seafloor rocks are about
A. 300-500Ma B. 100-125Ma
C. 180-200Ma D. 600-700Ma
7. The magnetic minerals loss their magnetic behavior & orientation as heated above temperature called
A. Hess Point B. Einstein Point
C. Wegener Point D. Curie Point
8. The oldest oceanic lithosphere is found in
A. Atlantic Ocean B. Pacific Ocean
C. Redsea Ocean D. Indian Ocean
9. The youngest oceanic lithosphere is found in
A. Atlantic Ocean B. Pacific Ocean
C. Redsea Ocean D. Indian Ocean
10. The general term that refers to the deformation of Earth's crust & results in the formation of structural features such as mountains is
A. Subduction B. Mass wasting
C. Volcanism D. Tectonics
11. The name given by Alfred Wegener to supercontinent he believed existed prior continents was
A. Pantheon B. Pangaea
C. Euroamerica D. Atlantis
12. Beneath Earth's lithosphere, the hotter, weaker zone known as the _____ allows for motion of Earth's rigid outer shell.
A. Oceanic crust B. Asthenosphere
C. Outer core D. Moho Boundary
13. Earth's rigid outer shell is called the
A. Lithosphere B. Hydrosphere
C. Asthenosphere D. Biosphere
14. Complex mountain systems such as the Alps, Appalachians, & Himalayas are the result of
A. Oceanic-Continental Convergence Boundaries
B. Continental-Continental Convergence Boundaries
C. Oceanic-Oceanic Convergence Boundaries
D. Hot Spot & Mantle Plume
15. Average of rates of seafloor spreading is _____ cm/yr
A. 2-3 B. 3-4
C. 6-7 D. 9-10
16. Red Sea is believed to be the site of a recently formed
A. Gradational boundary B. Divergent Boundary
C. Hotspot D. Convergent Boundary
17. The type of plate boundary where plates move apart, resulting in upwelling of material from the mantle to create new seafloor, is a _____ boundary
A. Transform fault B. Divergent Boundary
C. Conservative Boundary D. Convergent Boundary
18. During oceanic-continental convergence, as the oceanic plate slides beneath overriding plate, a _____ is often produced adjacent to the zone of subduction
A. Transform fault B. Divergent Boundary
C. Deep-ocean ridge D. Deep-ocean trench
19. Divergent plate boundaries can be described as
A. Normal & Reverse B. Constructive
C. Destructive D. Conservative
20. The longest topographic feature on Earth's surface
A. Oceanic Ridge B. Himalayas Mountains
C. E-African Tribel Junction D. Marianas Trench
21. Image of normal and reverse magnetism
A. Present B. Mirror image
C. Random D. No pattern
22. The chain of volcanic structures that extends from the Hawaiian Islands to Midway Island & then continues northward toward the Aleutian trench have formed over a _____ as the Pacific plate moved.
A. Volcanic island arcs B. Hot spot
C. Subduction zone D. Divergent boundary
23. New oceanic crust along the ridge will cool & _____
A. Slide down the ridge B. Drag across the ridge
C. Push upward D. Cannot move
24. The circular motion of convection occurs because it is
A. Differences in heat B. Differences in density
C. Independent of heat D. A & B
25. Most of Earth's seismic activity, volcanism, & mountain building occur along
A. Lines of magnetism B. Random trends
C. Hot spots D. Plate Boundaries
26. Paleomagnetism that exhibit a pattern or orientation different than the modern-day magnetic field is labeled
A. Abnormal Polarity B. Magnetic Anomaly
C. Reverse Polarity D. Normal Polarity
27. The seafloor spreading hypothesis is supported by
A. Magnetic Anomalies B. Age of sediments
C. Drilling of the oceans D. All of them
28. Glacial deposits covering extensive areas of the modern-day Southern Hemisphere, including India, 300 million years ago is evidence for
A. Ancient mountain rings B. Position of Pangaea
C. Global Climate D. All of them
29. The Andes mountain is part of a continental volcanic arc associated with _____
A. Oceanic-Continental Convergence Boundaries
B. Continental-Continental Convergence Boundaries
C. Oceanic-Oceanic Convergence Boundaries
D. Hot Spot & Mantle Plume
30. The magnetic time scale over the last few million years was developed using
A. Lava flows B. Oceanic floor
C. Radioactive Dating D. All of them
31. Ridge push is most important at
A. Divergent Boundary B. Subduction Zone
C. Mantle-Core Boundary D. Moho Boundary

ANSWERS

Chapter Three

Question One (Q1)

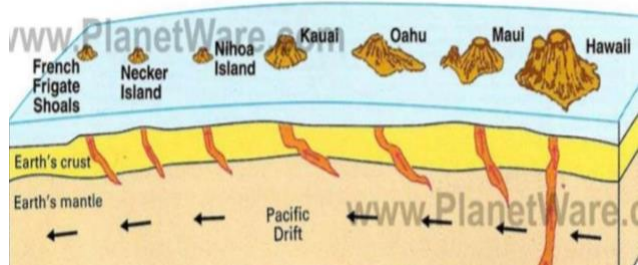
- 1 **More Plastically**
- 2 **Polar-Wander Curve**
- 3 **Toward**
- 4 **Hotspot**
- 5 **Stress & Strain (respectively)**

Question Two (Q2)

1	2	3	4	5	6	7	8	9	10
F	F	F	T	T	T	T	F	T	F
11	12	13	14	15	16	17	18	19	
T	T	T	F	F	T	F	F	F	

Question Three (Q3)

Hot Spots is the area of high heat flow & volcanic activity attributed to rising warm mantle plumes that originating at mantle-core boundary. However, the hot spots remain fixed in their position & lithosphere move over them, so the result should be a volcanoes of differing ages with the youngest closest to the hot spot & oldest away from hotspot (e.g. Hawaiian) in which the orientation of islands indicates direction of plate movement, & the kink indicates the changes in the direction of movement through time, & the ages of the rocks indicates the rate of plate movement



The plate motion are derived by convection cells that result of unequal distribution of heat & density within the earth & take place within the mantle, as hot materials rises up leads to ridge push (i.e. seafloor spreading at MORs) & cold materials rises down leads to slab pull & slab suction (i.e. oceanic tranche), & transform fault take place in between.

1. **Fit of the continents:** similarity in coasts of different continents (e.g. Africa & S-America)
2. **Paleoclimate:** glacier deposits & jungle plants
3. **Structural similarity:** age, fossils, & chemistry between mountains in different continents
4. **Paleofossils:** e.g. Mesosaurus

1. Polar-Wander curve of the continental rocks
2. Paleomagnetism near mid oceanic ridges
3. Seafloor spreading: the age of sediments & basalts decreases away from mid oceanic ridge
4. Topography of the oceanic crust: mid oceanic ridge, trenches, volcanoes, island & volcanic arcs

ANSWERS

Chapter Three

5 Lack of the mechanism for moving the continents (Wegener proposed that continental crust move through the oceanic crust like ice cut with ice!)

- 6 1. The amount & type of stress applied
2. The physical properties of the material
3. The time in which stress was applied

- 7 1. **Upwarping & Doming:** due to magma that rises beneath the continental crust
2. **Faulting:** due to heat from the magma
3. **Continental Rifting (Depression):** due to faulting that weaken the rocks (such as Afar depression)
4. **Linear Sea:** water collects in the depression areas forming sea (such as Gulf of Aqaba)
5. Mid oceanic ridges & seafloor spreading

- 8 1. Polar wandering curve
2. Seafloor spreading & Age of seafloor
3. Mantle Plumes & Hotspots
4. Satellite Technology

9 By mapping of earthquakes & volcanic activities that concentrated at plate boundaries

- 10 1. Place of accumulate of terrigenous sediments
2. Volcanoes form where molten material rises up
3. Island arcs: a line of volcanic islands
4. Earthquakes due to Great stresses
5. Mountain building

11 Continental- Continental convergance, in which India was drifted toward Asia & Himalayas were built up, & Appalachian were built in the same way as Africa & N-America converged prior to Pangaea breakup

12 The MOR consist of short segments slightly offset from one another (fault, or break in the lithosphere known as a transform fault)

13 Confining Pressure increase faster than Temperature

- 14 1. **Compressive:** Squeeze or compress the object
2. **Tensile:** Pull the object apart
3. **Shearing:** slides objects past each other

15 **Elastic:** The material returns to its original size & shape

Plastic: The changes are permanent

Rupture: If stress increased, solids break or rupture

16 **Ductile:** High plastic deformation without breaking

Brittle: Rupture before plastic deformation

17 As seawater circulates via fresh & hot lithosphere, it is heated, reacts with the rock, & become metal-rich, & as gushes back out of the sea floor, cooling & reacting with cold seawater & precipitate valuable deposits

- 18 1. Tensional forces pulling the plates apart
2. Rising hot asthenosphere along the rift zone

19 Rate of stress, time of stress applied, & type of materials

20 continents need not scrape across or plow solid rock but they can be pictured as sliding over a softened & layer

Question Four (Q4)

1	Is a curve that showing the apparent movement of the magnetic pole relative to the continent with time
2	is the theory by Alfred Wegener, State that all of the continental crust had once formed a single supercontinent, called Pangaea, about 200Ma, which had then split apart & moving to their present positions
3	is the divergent boundary where formation of new oceanic lithosphere take place, in which the basalt & sediments are youngest & thinner close to Mid-Oceanic Ridge (MOR)
4	is the longest topographic feature on the earth's surface, & located where sea floor spreading take place, in which new oceanic lithosphere are create & older one pushed away
5	is the triple junction in which Afar Depression & Aden Gulf is passive parts & red sea is active part (where sea floor spreading take place)
6	is the area where one plate pushed under the other & descend into the asthenosphere where subjected to higher pressure & metamorphosed into denser rocks or undergo to partial melting

Question Five (Q5)

A	Oceanic crust
B	Oceanic trench
C	Continental crust (& Overriding plate)
D	Subducted plate (& Subduction zone)
E	Asthenosphere where partial melting take place

Question Five (Q5)

	1	2	3	4	5	6	7	8	9	10	11
	B	A	A	D	C	C	D	B	A	D	B
	12	13	14	15	16	17	18	19	20	21	22
	B	A	B	A	B	B	D	B	A	B	B
	23	24	25	26	27	28	29	30	31		
	A	D	D	C	D	B	A	D	A		

MIDTERM EXAM

CHAPTER FOUR EARTHQUAKES

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Q1 Fill in the space to complete the following sentences

1. Creep sometimes termed _____ that meaning displacement occurs without earthquakes activities
2. Signs of liquefaction include _____ that formed as liquified soils bubbles to the surface during quake
3. _____ expansion of wet soll as freezes
4. At high T rocks tend to behave _____
5. _____ is a point on the fault at which first movement occurs to produce earthquakes
6. _____ dip-slip fault in which the block above the fault moved up relative to the block below
7. _____ is an earthquake that follow the main shock & has less magnitude than main shock
8. _____ a shallow dipping reverse fault
9. Changes in the continent of _____ gas is an important factor in the earthquakes production

Q2 Answer the following questions briefly

1. The surface affects produced by earthquake of a given magnitude vary as a result of (3points)
2. Fluid Injection is a possible means of minimizing the risk of large earthquakes. How??
3. What are the type of seismic waves?
4. What is the liquification?

Q3 Answer the following questions with True(T) / False(F)

1. Saturation of unconsolidated materials reduces the friction between particles
2. Falls are common along rocky coastlines
3. The downslope pull tending to cause mass movements is called the shearing strength
4. Rock creep occurs more commonly than soil creep
5. In the rocks fault are produced by plastic deformation
6. Ductile behavior characterized most of surface rocks
7. Rocks are stronger under tension than compression
8. Deeper earthquakes occur frequently under tranche
9. Divergent boundary is characteristic by normal faults
10. The wavelength measures the intensity of earthquakes
11. The elastic deformation occur in which the materials returns to original size & shape after removal of stress

12. A transform fault is a type of strike-slip fault & reflects stresses acting Vertically

Q4 Choice the correct answer in the following sentences

1. One of the following is primary hazard with earthquake
 - A. Ground rupture & faulting
 - B. Tunami
 - C. Fire
 - D. Flooding
2. Earthquake of magnitude 5 on the Richter scale releas about _____ timas energy than magnitude 2
 - A. 30.0
 - B. 900.0
 - C. 1,000.0
 - D. 27,000.0
3. In the San Francisco earthquake, which one of the following harards caused the geatest damage
 - A. Ground mation
 - B. Landslides
 - C. Tsunami
 - D. Fire
4. Most structural damage from earthquakes is caused by
 - A. Compressional waves
 - B. Body waves
 - C. Surface waves
 - D. Primary waves
5. The concept that major earthquakes occur in periodic intervals on a given fault zone is known as
 - A. Seismic cycle
 - B. Earthquake cycle
 - C. Earthquake period
 - D. Seismic probabilty
6. Transform faults are associated with
 - A. Divergent plate boundary
 - B. Convergerit plate boundary
 - C. Subduction zone
 - D. Hot spot & Mantle plume

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ANSWERS

Chapter Four

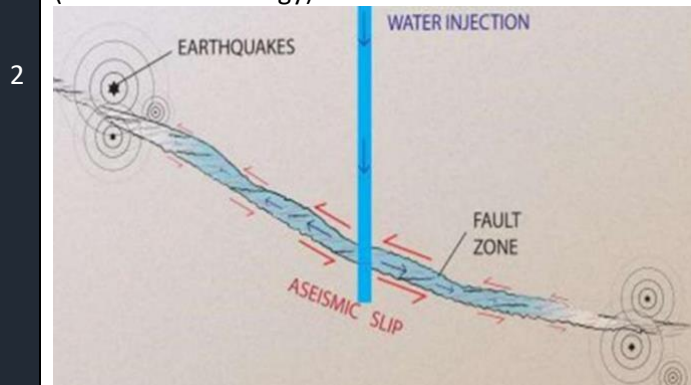
Q1

- 1 seismic slip
- 2 sand boils
- 3 Liquefaction
- 4 More plastically
- 5 Focus, Hypocenter
- 6 Reverse fault
- 7 Aftershock
- 8 Thrust Fault
- 9 Radon

Q2

- 1
 - A. Local geologic conditions
 - B. Nature of local geology: the area affected is near the coast?, Whether the terrain is steep or flat?
 - C. Quality of construction
 - D. Distance from the epicenter

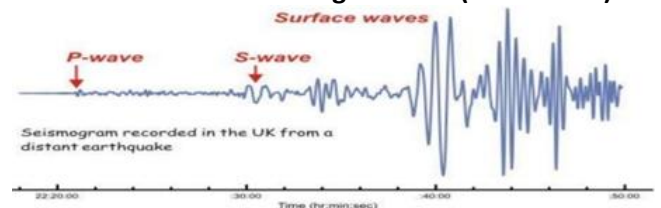
Fluid ejection: is the techniques used in seismic gaps areas to produce several small earthquakes rather than large earthquake (moderate earthquakes' effects) by increased fluid pressure in the cracks & pore spaces in the rocks that reduce frictions between particles & allow release of built-up stress (accumulated energy)



ANSWERS

Chapter Four

1. **Body waves:** Travel through earth interior (Smaller in amplitude, cause less structure damage, & faster than surface)
 - a. **P-Waves:** Primary or Compressional waves, Compress & expand matter like Slinky toy, Fastest & Weakest wave, can travel through Liquid, Solid, or Gas
 - b. **S-Waves:** secondary or shear waves, involving a side-to-side movement, Faster than surface wave, slower than P, weaker than surface wave, & can travel through Solid only
2. **Surface waves:** Larger in amplitude, cause more structure damage, & Slower than body waves. Cause rocks & soil to be displaced in such a way that the ground surface ripples or undulates, & similar to waves on water
 - a. **Vertical motions (rhyleigh)**
 - b. **Horizontal shearing motions (love waves)**



- 4 secondary hazard of earthquakes, occur when the wet soil is shaken (water seep between particle, reducing friction) & cause the buildings to sinks into the liquefied soil

Q3

1	2	3	4	5	6	7	8	9	10	11	12
T	F	F	F	F	F	F	T	T	F	T	T

Q4

	1	2	3	4	5	6	
	A	B	D	C	B	A	