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| Geology Department<br>Faculty of Science<br>Assiut University | | Time: 3 Hours<br>September 2022<br>Summer Term<br>Final-term Exam |

# Principles of Petrology (G-324)
## Students: 3rd level of Geology

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## Part one: Igneous and metamorphic rocks (25 marks)

اجب عن الاسئلة الاتية موضحا اجابتك بالرسم ان امكن.

1. اشرح العوامل المختلفة التى تؤدى الى التمايز الصهيرى (التبلور التجزيئى). 8 درجات

2. تكلم عن السلاسل المختلفة للصخور النارية واسباب اختلافها مع ذكر الخصائص الكيميائية لكل سلسلة. 8 درجات

3. اكتب باختصار عن ثلاثة عناصر مما ياتى 9 درجات

ا. التركيب المعدنى للصخور النارية.

ب. التركيب الكيميائى للمعادن السليكاتية.

ج. انواع التحول الاقليمى Regional metamorphism

د. انواع التحول المحلى Local metamorphism

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مع تمنياتنا بالنجاح

ا.د. على عبدالقادر

## Part Two: Sedimentary Rocks

***Answer the following questions:***

1. **The degree to which sediment particles become rounded depends on their hardness, how far they are transported, and the energy of their collisions with other particles (1 mark).**
   a. True.
   b. False.

2. **Erosion is the grinding away and removal of Earth's surface materials by moving water, air, or ice (1 mark).**
   a. True.
   b. False.

3. **Animal and vegetable life don't contribute to the formation of sedimentary rocks (1 mark).**
   a. True
   b. False

4. **Sediments undergo erosion, transportation and burial before becoming sedimentary rocks (1 mark).**
   a. True.
   b. False.

5. **Sedimentary rocks are formed from magma or lava (1 mark).**
   a. True.
   b. False.

6. **The grain size of a sandstone is larger than that of a shale (1 mark).**
   a. True.
   b. False.

7. **The main differences between a breccia and a conglomerate are particle size, particle shape, color and mineral composition (1 mark).**
   a. True.
   b. False.

**8. Detrital sedimentary rocks are classified on the basis of their particle sizes (1 mark).**

a. True.
b. False.

**9. Detrital rocks refer to which type of sedimentary rocks (1 mark)?**

a) Mechanically formed.
b) Organically formed.
c) Chemically formed.
d) Residual.

**10. Example of chemically formed sedimentary rocks is.....(1 mark).**

a) Gypsum.
b) Sandstone.
c) Shale.
d) Breccia.

**11. Pick the organically formed sedimentary rock (1 mark).**

a) Shale.
b) Sandstone.
c) Breccia.
d) Limestone.

**12. The highest grade of coal is.....(1 mark).**

a. Peat.
b. Lignite.
c. Bituminous.
d. Anthracite.

**13. The layered arrangement in sedimentary rocks is called .....(1 mark).**

a. Mud cracks.
b. Stratification.
c. Rain prints.
d. Ripple marks.

**14. Type of bedding where sorting and arrangement has occurred based on grain size is.....(1 mark).**

a. Cross bedding.
b. Lamination.

c. Graded bedding.
d. Mud cracks.

**15. Breccia is formed by which process.....(1 mark).**
a. Mechanical.
b. Chemical.
c. Organic.
d. Residual.

**16. Conglomerates consist of which shaped fragments mostly (1 mark)?**
a. Angular.
b. Sub-angular.
c. Rounded.
d. Edged.

**17. Which is the dominant mineral in sandstone (1 mark)?**
a. Mica.
b. Diamond.
c. Quartz.
d. Felspar.

**18. Shale refers to a rock formed from.....(1 mark).**
a. Sand sized material.
b. Plant remains.
c. Clay minerals.
d. Carbonate.

**19. The tendency for variations in current velocity to segregate sediments on the basis of particle size is called.....(1 mark).**
a. Lithification.
b. Compaction.
c. Metamorphism.
d. Sorting.

**20. Which of the following types of currents can transport sand grains (1 mark)?**
a. Rivers.
b. Wind.
c. Ocean waves.

d. All of these.

**21. Which of the following lists is written in order of decreasing particle size (1 mark)?**

a. Sandstone, siltstone, conglomerate.
b. Sandstone, conglomerate, siltstone.
c. Conglomerate, sandstone, siltstone.
d. Siltstone, sandstone, conglomerate.

**22. What is the difference between a breccia and a conglomerate (1 mark)?**

a. Breccias are coarse grained and conglomerates are fine grained.
b. Conglomerates are coarse grained and breccias are fine grained.
c. Breccias have rounded fragments and conglomerates have angular fragments.
d. Breccias have angular fragments and conglomerates have rounded fragments.

**23. A feldspar-rich sandstone is called.....(1 mark).**

a. Arkose
b. Litharenite.
c. Quartz arenite.
d. Shale.

**24. Whether a sedimentary rock consists of a wide or a narrow range of grain sizes depends primarily on.....(1 mark).**

a. The shape of the grains.
b. The mineralogy of the source rock.
c. The energy of the transporting agent.
d. The latitude in which the sediment was deposited.

**25. All sedimentary rocks form.....(1 mark).**

a. Under water.
b. At or near a planet's surface.
c. By the compression of soil layers.
d. Through the settling of crystals in magma chambers.

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*Best wishes* *Dr. Abdalla El Ayyat*

Assiut University
Faculty of Science
Department of Geology

جامعة أسيوط
كلية العلوم
قسم الجيولوجيا

| 2021/2022 Summer Semester, Final Examination<br>On: Earthquake Seismology and Seismic Prospecting (G-350) | | |
|---|---|---|
| 14 September 2022 | (Total Marks: 50) | Time: 2 hours |

***Answer the following questions:***

**First Question: Choose the correct answer:** **(35 marks; one mark each)**

1. **Which of the following sequences correctly lists the different seismic wave arrivals from first to last?**
   a) P-waves ... S-waves .... Surface waves
   b) Surface waves ... P-waves .... S-waves
   c) P-waves ... Surface waves ... S-waves
   d) S-waves ... P-waves .... Surface waves

2. **Earthquake A has a Richter magnitude of 7.0 as compared with earthquake B's 6. The amount of ground motion is one measure of earthquake intensity.**
   a) A is 10X more intense than B
   b) A is 1000 more intense than B
   c) B is 0.01X as intense than A
   d) A is 100 more intense than B

3. **Which of the following describes the buildup and release of stress during an earthquake?**
   a) the Modified Mercalli Scale
   b) the elastic rebound theory
   c) the principle of superposition
   d) the travel time difference

4. **How do rock particles move during the passage of an S-wave through the rock?**
   a) perpendicular to the direction of wave travel
   b) back and forth parallel to the direction of wave travel
   c) in a rolling elliptical motion
   d) in a rolling circular motion

5. **16. Which of the following can trigger a tsunami?**
   a) undersea earthquakes
   b) undersea landslides
   c) the eruption of an oceanic volcano
   d) all of these

6. **Which of the following statements is false?**
   a) Most earthquakes occur at plate boundaries
   b) The time and location of most major earthquakes can be predicted several days in advance
   c) Earthquakes can be caused by normal, reverse, and strike-slip faulting
   d) P-waves travel faster than both S-waves and Surface waves

7. **At convergent plate boundaries where oceanic and continental crust meet:**
   a) no associated volcanism occurs
   b) oceanic crust is subducted
   c) continental crust is subducted
   d) oceanic crust is created

8. **Which of the following statements best describes the state of earthquake prediction?**
   a) scientists can accurately predict the time and location of almost all earthquakes
   b) scientists can accurately predict the time and location of about 50% of all earthquakes
   c) scientists can accurately predict when an earthquake will occur, but not where
   d) scientists can characterize the seismic risk of an area, but can not yet accurately predict most earthquakes

9. **We record ground shaking with an instrument called a _____, and the instrument makes a recording on a device called a _____ mostly these days with digital computers. The recording itself is called a _____.**
   a) seismometer...seismograph...seismogram
   b) seismograph...seismogram...seismometer
   c) seismogram...seismometer...seismograph
   d) seismometer...seismogram...seismograph

10. **How often do magnitude 8.0 earthquakes occur?**
   a) about 5 to 10 times per year
   b) about once a year
   c) about every 5 to 10 years
   d) about every 50 to 100 years

11. **Which of the following can be triggered by an earthquake?**
   a) tsunami
   b) intense ground shaking
   c) a landslide
   d) all of these

12. **The boundary between the crust and the mantle is mostly chemical. This boundary is referred to as the _____**
   a) Gutenberg discontinuity
   b) Lehman discontinuity
   c) Mohorovičić discontinuity
   d) None of them

13. **There are three types of boundaries: _____ where plates move apart from each other, _____ where plates move toward each other, and _____ where plates slide alongside each other.**
   a) divergent…convergent…transform
   b) transform…divergent…convergent
   c) convergent…transform…divergent
   d) divergent...transform...convergent

14. **An earthquake will send out P-waves over the entire Globe, except for an area _____ of arc from the earthquake. This is called the P-wave shadow zone.**
   a) between 103° and 124°
   b) between 103° and 142°
   c) between 124° and 130°
   d) between 130° and 142°

15. **There are many different types of earthquakes. The most common are _____. These occur when rocks in the Earth's crust break due to geological forces.**
   a) tectonic earthquakes
   b) volcanic earthquakes
   c) collapse earthquakes
   d) explosion earthquakes

16. **A 7.2 earthquake releases about _____ more energy than a 6.2 earthquake.**
   a) 23 times
   b) 10 times
   c) 32 times
   d) 2 times

17. **An example of how local soil conditions can greatly influence local intensity is given by catastrophic damage of _____**
   a) 1981 (M 5.3) Aswan earthquake
   b) 1995 (M 6.9) Kobe (Japan) earthquake
   c) 1985 (M 8.1) Mexico City earthquake
   d) 2004 (M 9.1) Sumatra earthquake

18. **Why do some people die in some earthquakes more than others? Because of:**
   a) the power (magnitude) of the earthquake
   b) the level of development of the country
   c) the population density
   d) all of them

19. **Long-term forecasting of earthquakes is based mainly on the knowledge of when and where earthquakes have occurred in the past. It may include:**
   a) paleoseismological evidence
   b) development of seismic hazard maps
   c) identification of seismic gaps
   d) all of them

20. **Although _____ was the strongest one in Egypt, it was _____ that left the deepest imprint on everyone.**
    a) the 1995 (M 7.2) Gulf of Aqaba earthquake … the 1992 (M 5.9) Cairo event
    b) the 1995 (M 5.9) Gulf of Aqaba earthquake … the 1992 (M 7.2) Cairo event
    c) the 1969 (M 6.9) Shedwan earthquake … the 1992 (M 5.9) Gulf of Aqaba event
    d) The 1981 (M 5.3) Aswan earthquake … the 1995 (M 6.9) Shedwan event

21. **What parameters are seen from the seismic survey method?**
    a) Time characteristics
    b) Rock structure
    c) Density of the rocks
    d) Rock type

22. **All of the following are types of seismic waves, except:**
    a) Rayleigh wave
    b) Front wave
    c) Love wave
    d) P-wave

23. **The main requirements of the seismic source are:**
    a) The source waveform must be repeatable
    b) Energy must be safe and practical
    c) Sufficient energy only at the location
    d) Use as much energy as possible

24. **The total energy of the transmitted and reflected rays must equal to:**
    a) potential energy of a wave
    b) kinetic energy
    c) incident ray energy
    d) hydrocarbon energy

25. **Stress in the seismic method is?**
    a) A measure of the intensity of the seismic wave
    b) A measure of the intensity of these balanced internal forces
    c) A measure of physics of rock intensity
    d) A measure of magnetic intensity

26. **A certain limiting value of stress is known as:**
    a) Reflection strength
    b) Refraction strength
    c) Seismic strength
    d) Yield strength

27. **The reflection coefficient (R) is a numerical measure of the effect of an interface on wave propagation, and is calculated as the ratio of the:**
    a) Amplitude A1 of the incident ray to the amplitude A0 of the reflected ray
    b) Amplitude A1 of the reflected ray to the amplitude A0 of the incident ray
    c) Amplitude A0 of the incident ray to the amplitude A1 of the reflected ray
    d) Amplitude A0 of the reflected ray to the amplitude A0 of the incident ray

28. **The response caught from the ground is measured by a sensor in seismic land surveys called:**
    a) Barometer
    b) Voltmeter
    c) Geophone
    d) Hydrophone

29. **The shear modulus measures:**
    a) The resistance to change in volume of a liquid
    b) The resistance to change in volume of a solid
    c) The resistance to the flow of a liquid
    d) The resistance to change in shape

30. **_____ is a measure of the ability of a material to withstand changes in length when under lengthwise tension or compression.**
    a) Young's modulus
    b) Shear modulus
    c) Bulk modulus
    d) Poisson's ratio

31. **A _____ is a localized region within which the sudden release of energy leads to a rapid stressing of the surrounding medium.**
a) seismograph
b) seismic source
c) spread
d) geophone

32. **All of the following are land seismic sources except _____**
a) weight dropped from a truck
b) nuclear explosion tests
c) vibroseis
d) airguns

33. **In the _____, the detectors are laid out in a line that does not pass through the shot point.**
a) longitudinal profile
b) non-longitudinal profile
c) arc profile
d) none of them

34. **The _____ is the ratio of the amplitude A2 of the transmitted ray to the amplitude A0 of the incident ray.**
a) reflection coefficient (R)
b) acoustic impedance (z)
c) transmission coefficient (T)
d) Poisson's ratio

35. **In refraction seismic, the _____ is the wave that strikes a boundary between one seismic medium and another at a higher seismic velocity at the critical angle and is refracted by the perpendicular at a right angle.**
a) reflected wave
b) sound wave
c) surface wave
d) head wave

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**Second Question: True or False:** **(15 marks; one mark each)**

36. Earth's outermost layer is divided into 12 major tectonic plates. These plates move relative to each other a few centimeters per year. ( )

37. The subducting plates generate powerful earthquakes (sometimes very deep earthquakes up to 700 km) and usually create a line of volcanoes along the overriding plate boundary. ( )

38. At convergent plate boundaries, plates slide horizontally against each other, neither creating nor destroying the lithosphere. However, at these boundaries, powerful earthquakes can occur. ( )

39. The S-wave shadow zone is the area of the Earth's surface where S-waves are not detected following an earthquake. This shadow zone has led geologists to a model of the Earth with a liquid mantle and a solid core. ( )

40. Surface waves arrive at the seismograph after body waves, it is surface waves that are almost entirely responsible for the damage and destruction associated with earthquakes. ( )

41. Scientists use triangulation to find the epicenter of an earthquake. When seismic data is collected from at least three different locations, it can be used to determine the epicenter by where it intersects. ( )

42. The effect of an earthquake on the Earth's surface is called the magnitude. Its scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally destruction. ( )

43. The chief sources of historical earthquake data in Egypt are inscriptions, papyri, paintings, diaries, diplomatic records, and archeological evidence provided by temples and monuments. ( )

44. A horizontal gas-oil, gas-water, or oil-water contact produces a distinct reflection, especially where the reservoir is thick; such a reflection is called a bright spot hydrocarbon indicator. ( )

45. Reflection events terminate sharply as the point of reflection reaches the fault plane and resume again in displaced portions on the other side of the fault. ( )

46. Vertical slices may be taken through the seismic data volume to display the pattern of reflections intersected by any time plane. Such a representation of the 3-D data is known as a time slice or seiscrop. ( )

47. The collection of seismic traces that correspond to a particular midpoint is called a Common Midpoint (CMP) gather. ( )

48. Since there are an equal number of receivers on each side of the spread it is an off-end spread. ( )

49. Seismic Refraction Tomography (SRT) uses P- or S-wave travel times to map vertical and lateral changes in the subsurface. ( )

50. Fold or multiplicity is the number of times that the same midpoint is sampled by different shots and different receivers. ( )

*== Good Luck,,, ==*

***Assoc. Prof. Rashad Sawires***

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| **Geology Department**<br>**Faculty of Science**<br>**Assiut University**<br>**Assiut, Egypt** | | **Time: 2 Hours**<br>**September, 2022**<br>**Summer Term, Final Exam**<br>**3rd level of geology students** |

**Sedimentary environments**
**and**
**sedimentary basins (G335)**

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## A. Choose the correct answer

**1. Sedimentary facies is a term used to describe an association of sedimentary rocks that all formed..... (2 marks).**
a. at the same time but in different depositional environments.
b. from the same source rock but at different times in Earth history.
c. in the same depositional environment but at different times in Earth history.
d. none of the above.

**2. Which of the following may be indicative of sediment deposition in a non-marine terrestrial environment.....(2 marks).**
a. red colored sediments and traces of plant roots.
b. calcareous ooze.
c. manganese nodules and crusts.
d. slump and slide structures.

**3. Which one of the following can NOT be determined from an understanding of the conditions under which sedimentary rocks form? (2 marks).**
a. origin of the rock's component particles.
b. age of the rock.
c. method and length of sediment transport.
d. environment of deposition.

**4. How do we use composition and textures of sedimentary rocks as a record of the environment of sediment deposition? (2 marks).**

a. comparison with areas of modern (today) depositional environments (e.g., beaches).
b. comparison with areas of modern (today) erosional environments (e.g., mountain tops).
c. comparison with areas of ancient (long past) depositional environments (e.g., ancient beaches).
d. none of these.

**5. When rivers enter large bodies of standing water they typically debouche their loads forming.....(2 marks).**
a. alluvial fans.
b. submarine fans.
c. barrier islands.
d. deltas.
e. none of the above.

**6. Which of the following environments is an example of a shoreline/transitional environment? (2 marks).**
a. continental shelf.
b. delta.
c. organic reef.
d. open marine.

**7. The term "aeolian" refers to transport and deposition by.....(2 marks).**
a. the wind.
b. ocean waves.
c. pocket gophers.
d. running water.

**8. Of the following terms, which is considered to be a sedimentary structure? (2 marks).**
a. graded bedding.
b. ripple marks.
c. cross lamination
c. all of the above.

**9. Which of the following lists includes the three most common sedimentary environments? (2 marks).**

a. fluvial, aeolian, marine.
b. land, sea, air.
c. continental, marine, transitional.
d. deltaic, fluvial, aeolian.

**10. If you were to walk from a beach out into the open water, what would happen to the size of grains you walk over ? (2 marks)**

a. the grains would get progressively finer as you walk out into the open water.
b. the grain size would decrease as you move out, and then increase as you get closer towards the deepest parts of the ocean.
c. there would be no change in the grain size of the particles as you walk out to sea .

**11. The official definition of a sedimentary basin is a low area in the Earth's crust, of .....(2 marks).**

a. tectonic origin.
b. stratigraphic origin.
c. sedimentary origin.
d. all the above.

**12. Sedimentary basins are filled with strata deposited entirely in.....(2 marks).**

a. terrestrial environments, others with strata deposited below sea level in marine environments.
b. many basins include both kinds of sediments.
c. only on the continental slopes.
d. all the above.

**13. Subsidence in a sedimentary basin may be explained by three basic mechanisms, which include.....(2 marks).**

a. diagenesis, metamorphism and folding.
b. mechanical stretching, thermal subsidence and flexure loading.
c. cooling, uplifting, subduction.
d. none of the above.

**14. Mechanical stretching, to form sedimentary basin, is very important in divergent settings characterized by.....(2 marks).**

a. compressional conditions.

b. extensional stress conditions.
c. both compressional and extensional conditions.
d. none of the above.

**15. Basin analysis is usually comprises study of sedimentary succession at the surface and subsurface with respect to.....(2 marks).**
a. sedimentary facies, sedimentary structures.
b. fossil content, thickness of rock units.
c. evolution of the basin with time, thermal history of the basin.
d. all the above.

## B. True or False

**16. Fossils are the most useful tools in paleoenvironmental reconstructions. However their applications are highly limited in Precambrian rocks (2 marks).**
a. True.
b. False.

**17. Environments of equilibrium are surfaces of the earth, both on the land and under the sea, which for long periods of time are sites of deposition (2 marks).**
a. True.
b. False.

**18. The geometry of a sedimentary facies is defined as the two-dimensional shape of sedimentary bodies (2 marks).**
a. True.
b. False.

**19. Sedimentary structures are very important indicators of depositional environment because they are generated in place and can never have been brought in from outside (2 marks).**
a. True.
b. False.

**20. Sedimentary facies generates sedimentary environment (2 marks).**

a. True.

b. False.

**21. Sedimentary facies is defined as the place of deposition with physical, chemical, and biological conditions that characterize the depositional setting (2 marks).**

a. True.

b. False.

**22. On a small scale, hundreds to thousands of meters laterally, fault movements can create relief resulting in small but often deep basins (2 marks).**

a. True.

b. False.

**23. The essential element of the sedimentary basin is tectonic creation of relief, to provide both a source of sediment and a relatively low place for the deposition of that sediment (2 marks).**

a. True.

b. False.

**24. Intra-plate basins occur inside a plate and are situated away from plate boundaries (2 marks).**

a. True.

b. False.

**25. Aulacogen is an active arm of a three-armed rift system, two of whose arms continued to evolve to form ocean basins (2 marks).**

a. True.

b. False.

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***Best wishes*** ***Prof. Abdalla El Ayyat***