1. Ophitic texture is characteristic of
   a) A sandstone
   b) A granite
   c) A dolerite
   d) A syenite

2. A stratum contour is
   a) A strike line drawn for the bed
   b) A line drawn on the surface of the earth
   c) Always perpendicular to the strike line
   d) Always circular in nature

3. Mark the correct statement
   a) Only continental crust is created at the spreading centres
   b) Only oceanic crust is created at the spreading centres
   c) Both continental and oceanic crust are created at the spreading centres
   d) Both continental and oceanic crust are consumed at the spreading centres

4. Benioff zone is a
   a) A zone of volcanic activity
   b) A zone of mountain building activity
   c) A zone of neotectonic activity
   d) A zone of dipping seismicity

5. Axis of the fold is the place where
   a) The dip changes from one direction to another on the surface of the earth
   b) No change in the direction of dip on the surface of the earth
   c) It becomes horizontal on the surface
   d) It becomes vertical

6. Horizontal Equivalent is
   a) Distance between successive strike lines measured in a horizontal plain
   b) Perpendicular distance between successive strike lines measured in a horizontal plain
   c) Numerical difference between successive contour lines
   d) Numerical difference between successive contour lines measured along dip
7. Repetition of beds is acyclic
   a) in a folded sequence
   b) in a simple dipping sequence
   c) in a faulted sequence
   d) in an area where an unconformity is found

8. An inclined fault plane on an uneven surface will appear as
   a) A straight line
   b) An irregular/curved line
   c) Closed circular/elongated line
   d) Both as curved or straight line

9. Which show highest strain level value among all the Himalayan thrusts
   a) Main Boundary Thrust
   b) Main Central Thrust
   c) Main Frontal Thrust
   d) All the above

10. If you are flying a plane and you look down at the landscape, you are seeing a ……… view of the earth
    a) Map
    b) Cross-sectional
    c) Lateral
    d) Horizontal

11. Which of the following tectonic forces tend to push the objects in such a way so that they slide past one another
    a) Tensional
    b) Compressive
    c) Shearing
    d) None

12. Upfolds or arches of layered rocks are called
    a) Antiforms
    b) Faults
    c) Synforms
    d) Unconformities
13. Most appropriate example of Geomagnetic reversal is imprinted on the
   a) Rift basins
   b) Orogenic belts
   c) MORs
   d) Trenches

14. Ophiolites are associates with which of the following
   a) HFT
   b) MBT
   c) MCT
   d) ITSZ

15. Isoclinal folds have an interlimb angle of
   a) 80-90°
   b) 50-60°
   c) 0-10°
   d) 30-40°

16. Meandering of rivers takes place in the
   a) Young stage
   b) Mature stage
   c) Old stage
   d) (a and b) both

17. Arrange the following in increasing order of grain size
   I Sand  II Boulder  III Pebble  IV Silt
   a) I, II, IV, III
   b) II, III, I, IV
   c) IV, I, III, II
   d) IV, I, II, III

18. Which of the following sedimentary structure can be used as Plaeocurrent direction indicator
   a) Rainprints
   b) Mud cracks
   c) Flute marks
   d) Symmetric ripples
19. Symmetric folds with straight limbs and sharp hinges are called
   a) Kink folds
   b) Chevron folds
   c) Ptygmatic folds
   d) Recumbent folds

20. Ichnofossils are
   a) Casts
   b) Moulds
   c) Trace fossils
   d) None

21. S40°W may also be represented as
   a) 40°
   b) 140°
   c) 180°
   d) 220°

22. Ganga basin is
   a) Back arc basin
   b) Peripheral foreland basin
   c) Retro arc basin
   d) Remanant basin

23. How old are the oldest oceanic crust basalts
   a) 25 million years
   b) 4 billion years
   c) 200 million years
   d) 570 million years

24. If the Atlantic Ocean is widening at a rate of 3cm per year, how far will it spread in a million years
   a) 300 kilometers
   b) 30 miles
   c) 3 kilometers
   d) 30 kilometers
25. Rocks are weaker under ________________.
   a) Compressional Normal stress
   b) Compressional Shear Stress
   c) Extensional Normal Stress
   d) Extensional Shear Stress

26. Great Boundary Fault (GBF) is a ____________ type fault.
   a) Normal Fault
   b) Reverse Fault
   c) Thrust Fault
   d) Strike slip Fault

27. San Andreas Fault is a __________ type Fault
   a) Normal Fault
   b) Reverse Fault
   c) Thrust Fault
   d) Strike slip Fault

28. In which depositional environment are the sand grains best sorted and rounded?
   a) Glacial
   b) Aeolian
   c) Fluvial
   d) Deep marine

29. The layer in a sedimentary sequence thinner than 1cm is a
   a) Bed
   b) Stratum
   c) Lamina
   d) None of the above

30. Which of the following structure does not mark the top of the bedding?
   a) Wave ripples
   b) Current ripples
   c) Flute casts
   d) Rill marks
31. What is the main difference between a conglomerate and a sedimentary breccia?

a) Breccia clasts are angular; conglomerate clasts are rounded.
b) A breccia is well stratified; a conglomerate is poorly stratified.
c) Breccia clasts are the size of baseballs; conglomerate clasts are larger.
d) Breccia has a compacted, clay-rich matrix; conglomerate has no matrix.

32. The source rock for diamonds is called
a) granite
b) Kimberlite
c) kaesurtite
d) rhyolite

33. The difference between the polar to equatorial radius is______

a) 21 km
b) 42 km
c) 63 km
d) 10 km

34. The ratio of pore space in a sediment or sedimentary rock to the total volume of rock is known as

a) absolute porosity
b) Permeability
c) solution porosity
d) fracture porosity

35. The sedimentary rock that consists predominantly of gravel size (>2mm) clasts are termed as

a) breccia
b) conglomerate
c) siltstone
d) sandstone

36. Which one of the following constituents of limestone is characterized by concentric lamellae?

a) Peloid
b) Ooid
c) Oncoid
d) Intraclast
37. Which atmospheric region of the Earth will not exist if good Ozone is removed from the Earth’s atmosphere?
   a) Mesosphere
   b) Thermosphere
   c) Stratosphere
   d) Troposphere

38. Two radars R1 & R2 are located at same place and operating at 50 MHz & 100 MHz, respectively. After how much time an echo will be received by R1 & R2 from an object at 150 km from radars?
   a) 1 mili second & 1 mili second
   b) 1 mili second & 2 mili second
   c) 2 mili second & 1 mili second
   d) 2 mili second & 2 mili second

39. Height of the tropopause in the tropical region is ~17km. If the Earth surface temperature is ~ 30°C & laps rate is ~6°C per km. What will be tropopause temperature?
   a) 132°C
   b) -82°C
   c) -72°C
   d) -132°C

40. The organosedimentary structures formed by trapping and binding activities of blue-green algae (cynobacteria) are known as
   a) Stromatolites
   b) Stromatoporoids
   c) Trace fossils
   d) Index fossils

41. Atmospheric density is the maximum near the surface of the Earth due to
   a) Buoyancy force of the air.
   b) Gravitational force of the Earth.
   c) Coriolis force.
   d) Presence of aerosols & pollution.
42. Earth surface temperature is livable (~ 30°C) due to
   a) Presence of plants & humans.
   b) Higher air density in the lower atmosphere.
   c) Presence of the greenhouse gases
   d) Presence of oceans & water bodies.

43. Cirrus clouds are majorly made of ice & transparent. In which altitude range these are found in the Earth atmosphere?
   a) 1-3 km.
   b) 3-6 km
   c) 0.5-1 km
   d) 8-14 km

44. Temperature in the Earth’s mesosphere is decreasing with altitude due to which of the following the process?
   a) Radiative cooling
   b) Radiative Heating
   c) Greenhouse effect
   d) All of the above

45. An inflated balloon at the ground is taken in the aircraft flying at height of about 8 km. If the aircraft cabin is not pressurized, what would happen to the balloon?
   a) Balloon will shrink
   b) Balloon will be unaffected
   c) Balloon will expand and burst
   d) Balloon will remain unchanged

46. At what height the atmospheric density will fall to 0.5 kg m\(^{-3}\). Assume pressure & density decreases exponentially with scale height of 7.5 km, given surface pressure is 1013 hPa and density is 1.225 kgm\(^{-3}\)?
   a) 2.437 km
   b) 3.437 km
   c) 5.000 km
   d) 1.500 km
47. Maximum ozone concentration is found at ~27 km altitude region in the Earth’s atmosphere. Why is there a stratopause found at ~48 km and not at 27 km?

a) Stratopause is independent of ozone
b) Stratopause height is due to incoming solar UV flux and ozone distribution in the atmosphere
c) Stratopause is controlled by CO2
d) Stratopause height is controlled by greenhouse gases

48. RADAR (Radio Detection And Ranging) is used for detecting relatively bigger objects than LIDAR (Light Detection And Ranging), why?

a) RADAR using radio waves (having longer wavelength)
b) RADAR is active remote sensor
c) LIDAR is passive remote sensor
d) LIDAR using radio waves

49. LIDAR (Light Detection And Ranging) is used for detection of clouds. Back scattered signal is received from clouds due to which type of scattering?

a) Rayleigh scattering
b) Raman scattering
c) Mie scattering
d) Resonance scattering

50. What is the main reason for the higher tropopause height in the equatorial/tropical regions?

a) Turbulences cease to higher heights due to more solar energy is received in the equatorial regions.
b) Turbulences cease to lower heights due to more solar flux in the equatorial regions.
c) Turbulences cease to higher heights due to less solar flux in the equatorial regions.
d) Turbulences cease to lower heights due to less solar flux in the equatorial regions.

51. Lower part of the thermosphere is ionosphere. Ionosphere plays important role in

a) Radio wave propagation
b) Light wave propagation
c) Ultraviolet wave propagation
d) Infrared wave propagation
52. Different types of aerosols are causing different types of effects in the radiation balance of the atmosphere. Which of the following statement is correct?

   a) Sulphate rich aerosols cause warming
   b) Black carbon rich aerosols cause cooling
   c) Black carbon rich aerosols cause warming
   d) None of the above

53. Space weather effects are more pronounced in which region?

   a) Low latitude regions
   b) High latitude regions
   c) Over the equator
   d) Tropical regions

54. Rayleigh Lidar is used for the study of which of the following atmospheric parameters?

   a) Atmospheric Density
   b) Atmospheric Pressure
   c) Atmospheric Temperature
   d) All of the above

55. Ordinary commercial thermometer can not be used for measuring temperature at higher heights in the atmosphere. Why?

   a) Atmospheric density is very low at higher heights
   b) Atmospheric density is high at higher heights
   c) Atmospheric pressure is high at higher heights
   d) Due to presence of aerosols and pollution in the atmosphere

56. Variety of waves are present in the Earth’s atmosphere. These waves play important role in the atmospheric dynamics. Which are the most common and important waves are present in different regions of the Earth’s atmosphere?

   a) Mountain waves and Planetary waves
   b) Mountain waves and Ocean waves
   c) Gravity waves and Planetary waves
   d) Equatorial waves and Mountain waves
57. A relatively raised block due to relative uplift along the normal fault is:
   a) Horst
   b) Graben
   c) Trough
   d) Dome

58. The depth of Mariana Trench the deepest known submarine trench constituting the deepest location in the Earth's crust itself is
   a) 11.04 Km.
   b) 5.6 Km.
   c) 8.7 km.
   d) 3.7 km.

59. Marble is a metamorphic rock that forms from a ________ parent rock.
   a) Granite
   b) Sandstone
   c) Limestone
   d) Shale

60. “The present is key to the past” is referred as the Principle of ________________.
   a) Neptunism
   b) Plutonism
   c) Uniformitarianism
   d) Order of superposition

61. ______ is a measure of sharpness of corners of a grain, commonly measured in two dimensions
   a) Sphericity
   b) Roundness
   c) Surface texture
   d) Form

62. Which of the following structures does not represent erosion by a tool
   a) groove cast
   b) bounce mark
   c) brush marks
   d) ball and pillow structure
63. A limestone containing abundant bioclasts in microcrystalline calcite matrix can be called as:
   a) biolithite
   b) biosaparite
   c) biomicrite
   d) dismicrite

64. Chalk is a limestone composed of bioclast of _____.
   a) foraminifera
   b) coccolithophores
   c) diatoms
   d) ostracods

65. In general, the ocean does not respond to the seasonally changing insolation as strongly as the atmosphere. However, there is a region where the ocean circulation changes dramatically every year between summer and winter. Where and why?
   a) In the northern Indian Ocean due to changing wind patterns (monsoons) causing a reversal of currents.
   b) In the Pacific, due to the changing wind patterns caused by the so-called El Niño events.
   c) In the Antarctic, where winds change direction completely which becomes visible through reversal of the circumpolar current.
   d) In the wind-driven ocean gyres where plastic accumulates every summer when the gyres spin up, and where the plastic is released when the gyres slow down.

66. What are the primary factors driving mean global sea-level rise?
   a) Reduction of liquid water storage on land
   b) Warming of the ocean
   c) Vertical land movement
   d) Tides

67. Which is the most limiting nutrient for productivity in the surface ocean
   a) nitrate
   b) silicate
   c) aluminum
   d) d. cobalt
68. How many waters masses are there in the following figure (Y axis is temperate and X axis is salinity)

![Figure showing waters masses](image)

a) 4  
b) 3  
c) 2  
d) 1

69. In an ocean in the northern hemisphere, if there is high pressure on a particle in the east then what would be its direct (hint: assume geostrophic flow):

a) East  
b) West  
c) North  
d) South

70. If a person has to raft from Spain to the United states, his preferred path would be

a) along the north Atlantic current and gulf stream  
b) along the canary current, north equatorial current and gulf stream  
c) straight path to the US  
d) through Arctic

71. Denitrification occurs in

a) high productive region  
b) low salinity waters  
c) high temperature waters  
d) euphotic waters

72. San Andreas Fault is a ________ type Fault

a) Normal Fault  
b) Reverse Fault  
c) Thrust Fault
73. Which of the following reactions is the best representative of photosynthesis:

\[
\begin{align*}
a) & \quad \text{CH}_2\text{O} + \text{O}_2 & \rightarrow & \text{CO}_2 + \text{H}_2\text{O} \\
b) & \quad 2\text{C} + 3\text{H}_2 & \rightarrow & \text{C}_2\text{H}_6 \\
c) & \quad \text{H}_2 + \frac{1}{2} \text{O}_2 & \rightarrow & \text{H}_2\text{O} \\
d) & \quad \text{CO}_2 + \text{H}_2\text{O} & \rightarrow & \text{CH}_2\text{O} + \text{O}_2
\end{align*}
\]

74. Redfield ratio is traditionally defined as

\[
\begin{align*}
a) & \quad \text{ratio between the different conservative tracers in the ocean} \\
b) & \quad \text{ratio between scavanged type tracers} \\
c) & \quad \text{mean ratio of carbon, nitrogen and phosphorus in the organic matter} \\
d) & \quad \text{ratio of carbon, nitrogen and phosphorus in the surface waters}
\end{align*}
\]

75. The ocean’s salinity (the amount of dissolved salts in seawater) varies regionally. What are the processes that cause regional differences in salinity?

\[
\begin{align*}
a) & \quad \text{The local balance between rainfall and evaporation} \\
b) & \quad \text{Atmospheric circulation} \\
c) & \quad \text{Ocean currents} \\
d) & \quad \text{tides}
\end{align*}
\]

76. Deep water concentrations of most of the chemical constituents (such as nitrate, silicate, dissolved inorganic carbon) are always higher in the Pacific because

\[
\begin{align*}
a) & \quad \text{The particle flux to depth is stronger in the Pacific than the Atlantic.} \\
b) & \quad \text{The deep water in the Pacific is older than that in the Atlantic, so it has accumulated more of those elements with time.} \\
c) & \quad \text{Particles in the Atlantic sink faster, so much of the material reaches the sediments rather than being remineralised in the water column.} \\
d) & \quad \text{Deep water temperate of Pacific is lower than that in the Atlantic}
\end{align*}
\]

77. The total biomass of phytoplankton is over 100 times less than that of all land vegetation, yet the productivity of the two is about the same. How is this possible?

\[
\begin{align*}
a) & \quad \text{There is more light in the ocean, so phytoplankton can grow faster than land plants.} \\
b) & \quad \text{There is more CO2 in seawater than in air, so photosynthesis is more efficient in the ocean compared to on land.}
\end{align*}
\]
c) Land plants have a lot of structural biomass which is not photosynthetically active.
d) Ocean has more nutrients than that in the ocean

78. Density of ocean water
   a) is maximum at 8°C
   b) is maximum at 4°C
   c) is minimum at 4°C
   d) does not show an anomalous behavior

79. Which one of the following oceans is high nutrient low chlorophyll (HNLC) region
   a) Southern Ocean
   b) Bay of Bengal
   c) Wadden Sea
   d) Arctic Ocean

80. Which of the following global phenomena is not a human contribution to the Earth system?
   a) Production of plastic
   b) Production of black carbon
   c) Increase in $^{239-240}$Pu isotopes
   d) Formation of ozone in the atmosphere

81. A plate ‘O’, composed of oceanic crust, is converging towards another plate ‘C’ which is composed of continental crust. This leads to
   a) Subduction of O beneath C
   b) Subduction of C beneath O
   c) Collision of O and C
   d) Transform fault between O and C

82. Which one of the following is not a correct reason of origin of magma in upper mantle
   a) decrease in melting point due to decrease in pressure
   b) increase in temperature due to plate movements
   c) decrease in melting point due to incorporation of fluids
   d) increase in temperature by mantle plume

83. The difference between a Granite and Granodiorite is that
   a) Granite has more quartz than Granodiorite
b) Out of the total feldspar Granite has more Alkali-feldspar compared to Granodiorite
c) Out of the total feldspar Granite has more plagioclase compared to Granodiorite
d) Granite is plutonic and coarse grained while Granodiorite is fine grained

84. An archeological sample is found to have number of $^{14}$C atoms that are $\frac{1}{8}$th of the number of atoms that were initially present. If the half life of $^{14}$C is 5730 years, the age of the sample is-
   a) 45,840 years
   b) 17,190 years
   c) 716.5 years
   d) 2865 years

85. Uniformitarianism forms the cornerstone in Geology. However, some of the events in the Earth’s history can also be attributed to catastrophism. Which of the following events is caused by a catastrophic event?
   a) Extinction of Megafauna in Quartenary
   b) Extinction of Dinosaurs
   c) Formation of Himalaya
   d) Deposition of limestone in Cretaceous

86. It has been found that about every 100,000 years there has been an ice-age in the past 700,00 years. Which of the following cyclic processes matches this cyclicity?
   a) Change in the tilt of the Earth’s rotation axis
   b) Precession of the Earth’s rotation axis
   c) Change in the eccentricity of the Earth’s orbit
   d) Change in the Sun-spot activity

87. Which of the following is Not true about the solar system
   a) All the planets revolve around the sun in same direction
   b) More than 99% of the angular momentum of the solar system is with Sun but more than 99% of mass is with planets
   c) Distance of a planet from Sun is almost twice of that of its nearest neighbor
   d) Giant planets condensed farther from sun because they are made of volatiles which were driven away by Sun’s heat

88. Earth’s crust consists of continental and oceanic parts. Which of the following statement is not true
   a) Oceanic crust has global layering while continental crust doesn’t.
   b) Oceanic crust is thinner compared to continental crust
   c) Oceanic crust is younger than continental crust
d) Oceanic crust is more metamorphosed compared to continental crust.

89. With increasing grade of metamorphism, grain size
   a) increases
   b) decreases
   c) remains same
   d) slowly decreases

90. Theory of plate-tectonics explains the movement of plates on the earth’s surface. Average thickness of a plate is about
   a) 35 kms
   b) 8 kms
   c) 50 kms
   d) 100 kms

91. A coarse grained rock mainly composed of pyroxene and plagioclase is called as
   a) Basalt
   b) Gabbro
   c) Lherzolite
   d) Dolerite

92. Which of the following methods of geochronology overcomes the problem of unknown initial abundance of daughter isotope?
   a) Dating by assuming the initial abundance of the daughter isotope
   b) Dating by calculating the initial elemental concentration using the geochemical partition coefficients
   c) Dating by plotting an isochron using the co-genetic samples
   d) Dating by calculating the initial abundance by assuming the time of formation

93. The scattered intensity of particles which are of the same size as the wavelength will be
   a) Directly proportional to $\lambda^4$
   b) Inversely proportional to $\lambda^4$
   c) Directly proportional to $\lambda$
   d) Inversely proportional to $\lambda$

94. In the absence of greenhouse gases the Earth’s surface temperature would be
   a) 25°C
   b) -25°C
95. The Earth’s surface temperature in 2016 was
   a) Warmer by 0.99°C
   b) Colder by 0.50°C
   c) Warmer by 0.50°C
   d) Same as it was in year 1850

96. Stratospheric ozone will reach 1980 levels
   a) In 2025 as chlofulorocarbons (CFCs) have been removed from the atmosphere
   b) In 2020 as CFCs have short lifetimes
   c) In 2050 as CFCs have long lifetimes
   d) Never as CFCs cannot be removed from the atmosphere

97. Spot the wrong statement
   a) The lunar synodic month is 27.3 days
   b) The lunar siderial month is 27.3 days.
   c) The lunar synodic month is 29.5 days
   d) The lunar sideral month is less than the synodic month.

98. As the Moon’s elongation increases its phase
   a) always decreases
   b) first increases then decreases
   c) first decreases then increases
   d) always increases

99. Partial lunar eclipse occur when the
   a) moon is at slightly off the node in the penumbra region of the earth’s shadow on a full moon day.
   b) the moon is on the node in the umbra region of the earth’s shadow on a full moon day.
   c) moon is at slightly off the node in the penumbra region of the earth’s shadow on a new moon day.
   d) the moon is on the node in the umbra region of the earth’s shadow on a new moon day.
100. Spot the incorrect statement.

   a) Observers at different latitudes spot the north star exactly at the same altitude.
   b) The observer at the south pole can not locate the East or West.
   
   c) For observers at the north pole the half of the sky is visible all throughout the year.
   
   d) For observers at the equator the whole sky is visible all throughout the year.