1. Which of the following is not a thermally driven direct circulation?
   a) Polar cell in southern hemisphere
   b) Polar cell in northern hemisphere
   c) Hadley cell
   d) Ferrell cell

2. Geostrophy balance is…..
   a) Balance between Coriolis force and friction
   b) Balance between Coriolis force and gravity
   c) Balance between Coriolis force and pressure gradient
   d) Balance between Coriolis force and moisture gradient

3. Western boundary currents are
   a) Narrow cold pole ward currents
   b) Narrow warm pole cold ward currents
   c) Board warm equator ward currents
   d) Board cold equator ward currents

4. Monsoon trough is
   a) Land-sea thermal contrast
   b) Inter tropical convergence zone
   c) Low pressure due to strong heating
   d) Formation of strong low level winds

5. Cyclonic Eddie in the northern hemisphere
   a) Upwells ocean water cools the SST and favours biological activity
   b) Downwells ocean water, warms the SST and favours biological productivity
   c) Upwells ocean water, warms the SST and favours biological productivity
   d) Downwells ocean water, cools the SST and favours biological productivity

6. Pressure patterns have
   a) Low pressure in mid latitude and high pressure in tropic
   b) Low pressure in tropic and in mid latitude
   c) Low pressure in pole and tropics
   d) Low pressure in tropics and high pressure in mid latitudes

7. Climatic change due to greenhouse gasses favours
   a) Reduction in short wave coming to earth atmosphere
   b) Reduction in long wave coming to earth atmosphere
   c) Reduction in long wave going out of atmosphere
d) Increase in the longwave gong out of atmosphere

8. In the northern hemisphere if strong westerly winds is blowing then what should be the nature of the pressure gradient
   a) High pressure is in east and low in the west
   b) High pressure in west and low in the east
   c) High pressure in high latitudes and low pressure in low latitudes
   d) High pressure in low latitudes low pressure in high latitudes

9. If the rotation of the earth reduces by half what will happen to Hadley cell
   a) Meridional extend decreases
   b) Meridional extend increase
   c) No change in meridional extend
   d) Meridional extend will reach to pole

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

11. 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

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

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

14. Horizontal Equivalent is
    a) Numerical difference between successive contour lines
    b) Perpendicular distance between successive strike lines measured in a horizontal plain
    c) Distance between successive strike lines measured in a horizontal plain
    d) Numerical difference between successive contour lines measured along dip
15. 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

16. 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

17. Slickensides are a type of
   a) Foliation
   b) Bedding
   c) Lineation
   d) Fault plane.

18. 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

19. 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

20. 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

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

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

24. Cooling joints are …………….. in cross-section
   a) Hexagonal
   b) Circular
   c) Rectangular
   d) None

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

26. Molasses and Flysch are associated with
   a) Plate tectonics
   b) Orogeny
   c) Subduction
   d) Folding

27. Which of the following sedimentary structure can be used as paleocurrent direction
    indicator?
   a) Rain prints
   b) Mud cracks
   c) Flute marks
   d) Symmetric ripples

28. A right side up sedimentary sequence will have
   a) Coarse grains at the top
   b) Mixed grain size throughout the sequence
   c) Finest at the top
   d) None
29. Symmetric folds with straight limbs and sharp hinges are called
   a) Kink folds
   b) Chevron folds
   c) Ptygmatic folds
   d) Recumbent folds

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

31. S40º W may also be represented as
   a) 40º
   b) 220º
   c) 140º
   d) 180º

32. Ganga basin is
   a) Back arc basin
   b) Peripheral foreland basin
   c) Retro arc basin
   d) Remnant basin

33. A clastic rock is
   a) Rock formed from cementation of transported grains
   b) Rock formed from evaporation of sea water
   c) Transformed by heat into limestone
   d) Transformed by pressure into limestone

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

35. 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 kilometers
   c) 30 miles
   d) 3 kilometers
36. Cleopatra's Needle is a large stone monument that stood in an Egyptian desert for thousands of years. Then it was moved to New York City's Central Park. After only a few years, its surface began crumbling. What probably caused this crumbling?

a) Burrowing organisms  
b) It cannot crumble because it is granite  
c) Wet and variable Climate  
d) Freeze thaw cycles

37. Find out whether calcium carbonate, as calcite, will form on your facet as a result of the water composition. After water analysis, you find that \( [Ca^{2+}] = 10^{-3} \) M and \( [CO_3^{2-}] = 10^{-4} \) M. Determine with you would expect calcite to precipitate in this water given the reaction

\[
CaCO_3 (\text{calcite}) \leftrightarrow Ca^{2+} + CO_3^{2-}
\]

\[K_{sp} = 10^{-8.3}\]

a) It is in equilibrium  
b) Calcite will dissolve  
c) None of the above  
d) Calcite will precipitate

38. Find out the sequence of rocks

a) CEDAB  
b) CEADB  
c) CEDBA  
d) None of the above
39. Planet A and B are the distance of 2 AU and 4 AU. What is ratio of maximum time period to minimum time period of the planets?

a) $2 \sqrt{2} : 1$
b) $3 \sqrt{2} : 2$
c) $\sqrt{2} : 1$
d) $8 : \sqrt{2}$

40. You are selected for representing India and you land up in Canada which has latitude of 49 degree. At what altitude will you see the pole star.

a) 23.5 degree
b) 41 degree
c) 49 degree
d) -23.5 degree

41. Polaris was not the north star in the past because of

a) Motion of the earth around the sun
b) Rotation of the earth
c) Motion of the Sun through the galaxy
d) Precession of the Earth’s rotation axis

42. Stars on the Main sequence

a) Convert helium to hydrogen in their centres
b) Convert helium to carbon in their centres
c) Convert hydrogen to helium in their centres
d) Convert Carbon to Iron

43. Choose the false statement.

a) Lunar eclipse usually occurs during Full moon day
b) Partial lunar eclipse usually occur during New moon Day
c) Annular solar eclipse happens when moon comes between Sun and earth
d) Penumbral lunar eclipse happens when moon passes through penumbra.

44. Francis takes a closeup photograph sunspot. What would probably be the colour/wavelength of the sunspot seen in the photograph?

a) Blue
b) Blue – green
c) Red
d) Green – yellow

45. Stars which are members of same star cluster (more than one correct answer)

a) Are all of same age
b) Are all on the same branch of Hertzsprung-Russel diagram
c) All have same initial chemical composition
d) Are all about same distance from us

46. Which of the following changes could increase the frequency of Total solar eclipse? (more than one correct answer)
   a) Decrease the Size of Earth
   b) Decrease the radius of moon orbit
   c) Decrease the angle of inclination between the ecliptic plane and the moon’s orbit
   d) Decrease the size of sun

47. A star is having temperature of 5800 K. In which wavelength will you look for the star?
   a) 5 x 10^{-7} m
   b) 0.5 x 10^{-7} m
   c) 50 x 10^{-7} m
   d) 5.2 x 10^{-7}

48. The half-life of carbon-14 is approximately 6000 years. After 18,000 years what fraction of the initial quantity of carbon-14 would have decayed?
   a) ¼
   b) 1/8
   c) 7/8
   d) ¾

49. In the ocean, Redfield ratio (Carbon:Nitrogen:Phosphorus) is
   a) 100:10:1
   b) 106:10:1
   c) 106:16:1
   d) 100:16:1

50. While comparing the vertical profiles of particle reactive and bio-limiting elements for the Atlantic and the Pacific Ocean, why are the deep water concentrations are always higher in the Pacific?
   a) The deep water in the Pacific is older than that in the Atlantic, so it has accumulated more of those elements with time.
   b) The particle flux to depth is stronger in the Pacific than the Atlantic.
   c) Particles in the Atlantic sink faster, so much of the material reaches the sediments rather than being remineralised in the water column.
   d) Pacific is bigger than the Atlantic

51. Which process increases the salinity of surface sea water:
   a) Rainfall
   b) Riverine flux
   c) sea-ice formation
   d) upwelling
52. Following fig. presents the oxygen isotopic composition (δ¹⁸O in per mil) of foraminifera from a sedimentary core obtained from a higher latitude region. What kind of climate A and B represent in this figure?

a) A – warmer, B - colder
b) A – colder, B - warmer
c) A – colder, B - colder
d) A – warmer, B – warmer

53. One of the following is a scar of a subduction zone
a.) Red Sea
b.) Mediterranean Sea
c.) Indus-Tsangpo Suture Zone
d.) Atlantic Ocean

54. Which of the following occur in correct order in the Mohr’s scale of hardness?
a.) Talc, gypsum, calcite, apatite
b.) Orthoclase, quartz, topaz, corundum
c.) Fluorite, apatite, topaz, diamond
d.) Quartz, orthoclase, topaz, corundum
55. Which of the parameters are most likely represented at the ocean surface in the following figure (Red, blue and thistle colour represent high, moderate and very low concentrations, respectively).

![Ocean Surface Map]

World Ocean Atlas 2005

a) Iron and Molybdenum  
b) Zinc and cobalt  
c) Chlorophyll and primary production  
d) Nitrate and Phosphate

56. Name the following organism

![Organism Image]

a) Trichodesmium  
b) Diatoms  
c) Cocolithophore  
d) Crocospheara
57. Which of the following is the smallest possible organism?
   a) Prochlorococcus  
   b) Synechococcus  
   c) Trichodesmium  
   d) Cocolithophore

58. Ocean has $1.4 \times 10^{21}$ L water. Under steady state conditions, it receives (and loses) $434 \text{ km}^3$ water/year. What is the residence time of water in ocean?
   a) $3226 \times 10^{21}$ years  
   b) $3226 \times 10^{15}$ years  
   c) 32260 years  
   d) 3226 years

59. How many calories does it take to convert 1 g of ice into 1 g of water vapor?
   a) 100 calories  
   b) 540 calories  
   c) 80 calories  
   d) 720 calories

60. Oceanic Mixed Layer Depth (MLD) increases when
   a) rainfall occurs  
   b) sea surface temperature increase  
   c) wind speed over the ocean increases  
   d) primary production increases

61. N$_2$ fixation requires following nutrients
   a) Silicate  
   b) Zink  
   c) Iron and phosphate  
   d) Nitrate

62. During evaporation, ocean
   a) gets depleted in heavier isotopes of H and O  
   b) gets enriched in heavier isotopes of H and O  
   c) does not change  
   d) gets fresher

63. High Nutrient Low Chlorophyll (HNLC) regions are located in the
   a) equatorial oceans  
   b) tropical oceans  
   c) sub-tropical oceans  
   d) polar oceans

64. To change pH of a solution from 10 to 8, how many times do you expect a change in $[H^+]$:
   a) 1000
65. Which of the followings is true?
   a) Dry air in the atmosphere is heavier than water vapour
   b) Dry air in the atmosphere is lighter than water vapour
   c) Dry air and water vapour have equal weights in the atmosphere
   d) Carbon dioxide is the most abundant gas in dry air

66. The mass of one Avogadro number of dintrogen (N₂) atom is
   a) 7 g
   b) 14 g
   c) 28 g
   d) 14 x 6.02 x 10^{23} g

67. Element that impart colour to the mineral are called
   a) Idiochromatic
   b) Chatoyancy
   c) Allochromes
   d) Chromophores

68. Road metal should have a good
   a) Cleavage
   b) Rapid impact load
   c) Water holding capacity
   d) Fracture

69. Kyanite has a hardness value from
   a) 1-3
   b) 2.5-3.5
   c) 1.5-3.5
   d) 4.5-6.5

70. Among sandstones .......... is the best suited for outer wall of a building
   a) Arkose
   b) Lithic arenite
   c) Quartz arenite
   d) Greywake

71. Before using Armourstone its durability is to be assessed for resistance to
   a) Resistance to chemical decay and mechanical disintegration
   b) Good porosity and permeability
   c) Resistance to aquatic plants and animals
   d) Good shape and colour

72. ..........rock is ideally suited for roofing
   a) Granite
b) Sandstone  
c) Slate  
d) Basalt  

73. .......... is one of the most expansive minerals expanding by 3.76% between normal temperature and 570\textdegree{}c  
a) Feldspar  
b) Mica  
c) Olivine  
d) Quartz  

74. Hematite has a ............ streak  
a) Purple  
b) Orange blossom  
c) Cherry red  
d) Pistachio green  

75. Which of the atmospheric constituent is mainly responsible for the formation of the stratosphere in the Earth atmosphere?  
a) CO$_2$ (Carbon Dioxide)  
b) NO$_2$ (Nitrogen Dioxide)  
c) CH$_4$ (Methane)  
d) O$_3$ (Ozone)  

76. If the Earth has no atmosphere, how much radiation is reflected back to space assuming surface temperature T = 300K,  
a) 400.5 W/m$^2$/K$^4$  
b) 461.7 W/m$^2$/K$^4$  
c) 500.5 W/m$^2$/K$^4$  
d) 600.5 W/m$^2$/K$^4$  

77. A ballistic missile is fired due eastward at 30\textdegree{}N latitude. Which direction the missile will deflect due to Coriolis force?  
a) Northward  
b) Southward  
c) Eastward  
d) Westward  

78. If the Earth’s surface temperature is ~29\textdegree{}C and height of the tropopause is 15 km. If the average temperature lapse rate in the troposphere is 6\textdegree{}C per km, then what will be the temperature of the tropopause?  
a) -51\textdegree{} C  
b) -70\textdegree{} C  
c) -61\textdegree{} C  
d) -40\textdegree{} C  

79. Which one of the following is correct?  
a) The specific heat of land is higher than ocean
b) The specific heat of ocean is higher than land

80. Which type of electromagnetic radiation from sunlight is a principal source of vitamin D?
   a) Visible
   b) Ultraviolet
   c) Infrared
   d) All of the above

81. At which height atmosphere is the coldest, and what is the temperature at that height?
   a) 85 Km and \(-85^\circ\) C
   b) 18 Km and \(-50^\circ\) C
   c) 50 Km and \(-10^\circ\) C
   d) 150 Km and \(-100^\circ\) C

82. Which of the following are purely gas-scattering process in atmosphere?
   a) Rayleigh Scattering
   b) Mie Scattering
   c) Both (a) and (b)
   d) None of the above

83. What will be the number concentration of the air molecules at a standard pressure of 1013 hPa and temperature 288K?
   a) \(2.25 \times 10^{19}\) molecules/cm\(^3\)
   b) \(2.55 \times 10^{19}\) molecules/cm\(^3\)
   c) \(2.65 \times 10^{19}\) molecules/cm\(^3\)
   d) \(3 \times 10^{19}\) molecules/cm\(^3\)

84. Ionosphere significantly affects the propagation of which of the following waves?
   a) Radio Waves
   b) Optical Waves
   c) Microwaves
   d) Sound waves

85. Clear sky looks blue and cloudy sky looks whitish, due to?
   a) Rayleigh Scattering and Mie Scattering
   b) Mie scattering and Rayleigh Scattering
   c) Absorption and reflection
   d) Elastic Scattering and in Inelastic scattering

86. A RADAR is operating at 100 MHz and receives an echo from an altitude of 150 km? What will be the time delay between transmitted and received signal?
   a) 2 millisecond
   b) 1 millisecond
c) 3 millisecond 
d) 4 millisecond

87. Which region of the Earth atmosphere are turbulent?
   a) Stratosphere and thermosphere
   b) Troposphere and Mesosphere
   c) Stratosphere only
   d) Thermosphere and Exosphere

88. Which aquifers are formed due to secondary porosity?
   a) a & b
   b) b & c
   c) c & d
   d) a & d

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

90. Repetition of beds on a geological map may be due to
   a) Folding
   b) Erosion
   c) Unconformity
   d) a and b both
91. Which one of the following is NOT a cold current?
   a) Brazil current  
   b) Canary current  
   c) Peru current  
   d) California Current

92. Bay of Bengal mixed layer is
   a) Deeper due to fresh water flux and strong winds  
   b) Shallow due to fresh water flux and weak winds  
   c) Deeper due to fresh water and weaker winds  
   d) Shallow due to fresh water flux and strong winds

93. You are standing on surface of Mars and observe motion of planet Earth, Mercury, Jupiter, Saturn and Pluto. Choose the correct statement. (more than 1 correct answer)
   a) Mercury, Jupiter and Pluto show retrograde motion  
   b) Jupiter, Saturn and Pluto show retrograde motion  
   c) Earth and Mercury does not show retrograde motion  
   d) Mercury, Earth, Jupiter, Saturn show retrograde motion

94. Earth’s atmospheric density and pressure decreases exponentially with height why?
   a) Due to Oceans  
   b) Due turbulence  
   c) Due to gravity  
   d) Due to mountains

95. Which among the following is an important stratospheric ozone depleting agent?
   a) Chlorofluorocarbons  
   b) NaCl  
   c) Aerosols  
   d) Clouds

96. Which type of cloud is mostly made of ice crystals?
   a) Cumulonimbus cloud  
   b) Stratus Clouds  
   c) Cirrus Clouds  
   d) Altostratus clouds

97. Which one of the SiO$_2$ polymorphs may form may form because of meteorite impact?
   a) Quartz  
   b) Stishovite  
   c) Opal  
   d) Tridymite
98. A red coloured and clayey soil horizon is termed as
   a) B horizon
   b) O horizon
   c) A horizon
   d) E horizon

99. Mid oceanic spreading ridges are characterized by
   a) Dip slip faults
   b) Strike slip faults
   c) Normal faults
   d) Thrust faults

100. Which of the following processes is not related to plate tectonics?
    a) Subduction
    b) Rise of mountain plume
    c) Mountain building
    d) Sea floor spreading

Key Answers

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