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PAPER – III

EARTH, ATMOSPHERE, OCEAN AND PLANETARY SCIENCES

Signature of the Invigilator | Question Booklet No. ..... 020112 .....

1. | OMR Sheet No.. .....

Subject Code 02 | **ROLL No.** | | | | | | | | |

Time Allowed : 150 Minutes | **Max. Marks : 150**

No. of pages in this Booklet : 8 | No. of Questions : 75

INSTRUCTIONS FOR CANDIDATES

1. Write your Roll No and the OMR Sheet No in the spaces provided on top of this page.
2. Fill in the necessary information in the spaces provided on the OMR response sheet.
3. This booklet consists of seventy five (75) compulsory questions each carrying 2 marks.
4. Examine the question booklet carefully and tally the number of pages/questions in the booklet with the information printed above. **Do not accept a damaged or open booklet.** Damaged or faulty booklet may be got replaced within the first **5** minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time given.
5. Each Question has four alternative responses marked (A), (B), (C) and (D) in the OMR sheet. You have to completely darken the circle indicating the most appropriate response against each item as in the illustration.



6. All entries in the OMR response sheet are to be recorded in the original copy only.
7. Use only Blue/Black Ball point pen.
8. Rough Work is to be done on the blank pages provided at the end of this booklet.
9. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except in the spaces allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, you will render yourself liable to disqualification.
10. You have to return the Original OMR Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. **You are, however, allowed to carry the test booklet and the duplicate copy of OMR Sheet** on conclusion of examination.
11. Use of any calculator, mobile phone or log table etc. is strictly prohibited.
12. **There is no negative marking.**

02-16

SEAL

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PAPER-III
EARTH, ATMOSPHERE, OCEAN AND PLANETARY SCIENCES

1. Which of the following statements is *incorrect* ?
   (A) Sillimanite is optically 'length slow' mineral
   (B) Quartz is a uniaxial mineral
   (C) Forsterite shows pleochroism
   (D) (001) section of a mineral may show (100) and (010) cleavages

2. Basalt consists essentially of augite and :
   (A) Bytownite (B) Anorthite
   (C) Labradorite (D) Andesine

3. The intersection of geotherm and solidus of mantle results in :
   (A) Partial melting
   (B) Crystallization of minerals
   (C) Accumulation of minerals
   (D) Zoning in minerals

4. During thermal metamorphism of argillaceous rocks, the reaction between Al_2O_3 and SiO_2 produces :
   (A) Cordierite (B) Sillimanite
   (C) Spinel (D) Orthopyroxene

5. A fault in which the hanging wall moves up relative to foot wall is called :
   (A) Normal fault (B) Reverse fault
   (C) Screw fault (D) Shear

6. A structure in which older rocks lie outside and younger rocks inside is called :
   (A) Outlier (B) Inlier
   (C) Anticline (D) Fault

7. If the axial plane of a fold is parallel to the ground, the fold is called :
   (A) Asymmetrical fold (B) Normal fold
   (C) Recumbent fold (D) Syncline

8. Example of an Index fossil is :
   (A) Cidaris (B) Paradoxides
   (C) Glossopteris (D) Productus

9. First elephant on the earth appeared during :
   (A) Eocene (B) Jurassic
   (C) Permian (D) Miocene

10. Characteristic feature of Cephalopods :
   (A) Well developed eyes
   (B) Well developed head
   (C) Best swimmers
   (D) Best runners

11. What is the order of superposition from older to younger, if a fault cuts through a dyke and a sedimentary rock on a basement rock ?
   (A) Basement rock, dyke, fault, sedimentary rock
   (B) Basement rock, sedimentary rock, dyke, fault
   (C) Fault, dyke, sedimentary rock, basement rock
   (D) Sedimentary rock, basement rock, fault, dyke

12. A series of sub parallel ridges and troughs of small scale are called :
   (A) Mud cracks (B) Current bedding
   (C) Ripple marks (D) Cross bedding

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13. A sandstone with 25% feldspar is called :
(A) Arenite (B) Lithic arenite
(C) Arkose (D) Greywacke

14. The Ganga-Brahmaputra delta is a :
(A) Gilbert delta
(B) Wave dominated delta
(C) Tide dominated delta
(D) Estuary

15. Older seamounts are :
(A) Peaked and above mean sea level
(B) Peaked and below mean sea level
(C) Flat topped and above mean sea level
(D) Flat topped and below mean sea level

16. Manganese nodules are not found in :
(A) Indian ocean
(B) Peru basin
(C) CarionClipperton zone
(D) Iceland

17. Thermohaline circulation is a part of ocean circulation driven by :
(A) Temperature (B) Salinity
(C) Density (D) Pressure

18. ^{87}Sr concentration is lower in magmas derived from upper mantle because of :
(A) Lower concentration of radioactive parent ^{87}Rb in mantle
(B) Higher concentration of radioactive parent ^{87}Rb in mantle
(C) Lower concentration of ^{207}Pb in mantle
(D) Lower concentration of $^{207}Pb/^{235}U$ in mantle

19. In minerals, Ga substitutes for :
(A) Fe (B) Ca
(C) Al (D) K

20. A pressure-indicative reaction (geobarometer) should have :
(A) Large change in volume (dV) and small change in entropy (dS)
(B) Small change in volume and small change in entropy
(C) Large change in volume and large change in entropy
(D) Small change in volume and large change in entropy

21. The study of fluid inclusions deals with :
(A) Entrapped liquids in minerals
(B) Immissible fluids
(C) Ore fluids in ores
(D) Artificial inclusion of water in rocks

22. An Indian oil field that has carbonate as a host rock is :
(A) Ankaleshwar (B) Digboi
(C) Cauvery (D) Bombay high

23. Coalbed methane is :
(A) Natural gas in coal seems
(B) Oil in coal seams
(C) Oil shale in coal seams
(D) Salt dome in coal seams

24. Which of the following basins is formed during Mesoproterozoic ?
(A) Cuddapah basin (B) Bijawar basin
(C) Gwalior basin (D) Sonrai basin

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25. The succession of Semri-Kaimur-Rewa-Bhander Series represents :
(A) Vindhyans (B) Cuddapahs
(C) Gondwanas (D) Siwaliks

26. Rocks of age from 2500 to 542 Ma represent :
(A) Archean (B) Proterozoic
(C) Palaeozoic (D) Phanerozoic

27. Corals serve as indicators of :
(A) Paleoclimatic changes
(B) Petroleum reservoir
(C) Coalification
(D) Submarine volcanism

28. Emission of light by a substance without heating is called :
(A) Etching (B) Iridescence
(C) Luminiscence (D) Juvenescene

29. The tectonics during Neocene to the present is known as :
(A) Plate tectonics (B) Continental drift
(C) Seafloor spreading (D) Neotectonics

30. The first of operational Indian Remote Sensing Satellite (IRS-1A) was launched in :
(A) 1988 (B) 1987
(C) 1986 (D) 1985

31. In remote sensing study, EOS refers to :
(A) Earth observation satellite
(B) Earth observation system
(C) Earth observation science
(D) Earth oxygen system

32. Satellites travelling at the angular velocity at which the earth rotates in the same direction are said to be ?
(A) Geostationary (B) Geomagnetic
(C) Geographic (D) Geoelectric

33. What is the lime, clay ratio in cement ?
(A) 1:4 (B) 4:1
(C) 2:4 (D) 3:4

34. Grouting may be described as :
(A) A process of determining the strength of a tunnel
(B) A process of determining the strength of a dam
(C) A process of determining the permeability of rocks
(D) Injection of suitable cementing material to seal any open fissures

35. A secondary coating of crimson pink bloom is associated with :
(A) Cobalt (B) Vanadium
(C) Uranium (D) Lead

36. The pathfinder element for Au is :
(A) As (B) Ag
(C) Cu (D) Fe

37. Darcy's law is applicable to :
(A) Turbulence flow in porous media
(B) Lamina flow in porous media
(C) Turbulence flow in nonporous media
(D) Lamina flow in nonporous media

38. Permissible limit of fluoride in portable water is :
(A) 10 ppm (B) 0.5 ppm
(C) 20 ppm (D) 1.5 ppm

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39. Isolated hill that stands above well developed plains is known as :
(A) Playa (B) Inselberg
(C) Inlier (D) Pediment

40. Chemical weathering is a process of :
(A) Frost action and crystal growth
(B) Thermal expansion and contraction
(C) Mass exfoliation
(D) Hydration and hydrolysis

41. Westerlies are winds :
(A) Flowing from west to east between 30 to 60 degrees latitude
(B) Flowing from east to west between 30 to 60 degrees latitude
(C) Flowing from west to east between 60 to 90 degrees latitude
(D) Flowing from east to west between 60 to 90 degrees latitude

42. Karst topography is well developed in :
(A) Dense, highly jointed, thin bedded sandstone
(B) Dense, highly jointed, thin bedded limestones
(C) Dense, highly jointed, thin bedded siltstone
(D) Dense, highly jointed, thin bedded claystone

43. As glaciers retreat, large accumulation of debris left behind is known as :
(A) Outwash plains (B) Aretes
(C) Moraines (D) Troughs

44. Crescent-shaped lake formed as a result of meandering is called as :
(A) Salt lake (B) Glacial lake
(C) Oxbow lake (D) Crater lake

45. The down slope movement of debris due to gravity is called :
(A) Weathering (B) Mass movement
(C) Deposition (D) Erosion

46. Loess is formed by accumulation of :
(A) Sand (B) Silt
(C) Clay (D) Lime

47. Corpuscular energy emitted by the sun effects :
(A) Magnetic field surrounding the earth
(B) Precipitation in an area
(C) Landforms
(D) Rivers

48. A bundle of rays of radiant energy of different wavelengths :
(A) Isolation (B) Insolation
(C) Ionization (D) Incubation

49. Trade wind regime consists of :
(A) Sub-cloud layer
(B) Cloud layer
(C) Inversion and sub-layer
(D) All the above

50. An igneous rock essentially consisting of calcite is :
(A) Gabbro (B) Basalt
(C) Rhyolite (D) Carbonatite

51. What is the geothermal gradient of the earth :
(A) 30°C/km (B) 30°C/10 km
(C) 30°C/100 km (D) 3°C/km

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52. The time period, Tof $f(t) = \sum_{n=-\infty}^{\infty} \frac{5}{12} e^{-in\pi t}$ in the interval (0,T) is :

(A) 5/12 (B) 1
(C) 2 (D) π

53. The inverse Fourier transform of *f(at)* a time scaled continuous function is

(A) F(iaω) (B) (1/|a|) F(i ω/a)
(C) (1/a) F(iaω) (D) a F(iaω)

54. The electrostatic potential outside an infinite parallel layer of thickness 'd' and uniform charge density 'δ' is :

(A) Proportional to $1/r^2$
(B) Proportional to $1/r^3$
(C) Constant
(D) Proportional to 1/r

55. The electric moment per unit volume of a rectangular slab of an homogeneous isotropic dielectric when the electrostatic field is perpendicular to its cross section is equal to :

(A) Dielectric constant, ε
(B) ε /2
(C) ε /V; V = volume
(D) ε S *l*; S = surface area; *l* = length

56. The numerical quadrature formula for integration with unequal spaced intervals is :

(A) Newton's formula
(B) Simpson's Rule
(C) Weddel's Rule
(D) Gauss quadrature formula

57. The sum of the geometric and gravitational flattening of the earth is equal to the centrifugal force of the gravity at the equator multiplied by a factor :

(A) 3/2 (B) 5/2
(C) 1/3 (D) 2/5

58. The Koenigsberger ratio is the ratio of the :

(A) Induced to remnant magnetism
(B) Remnant magnetism to induced magnetism
(C) Magnetic intensity to the remnant magnetism
(D) Magnetic susceptibility to the remnant magnetism

59. The remanent magnetism of the earth is measured by :

(A) Proton Precession Magnetometer
(B) Fluxgate Magnetometer
(C) Alkali Vapour Magnetometer
(D) Cyogenic magnetometer

60. From paleomagnetic field studies the measured inclination would yield the distance between the :

(A) Present pole to the paleo-pole
(B) Site and the present pole
(C) Site and the paleo-pole
(D) Latitude of the paleo-pole

61. The compressional wave velocity in fluids for Bulk Modulus (K), rigidity modulus (μ) and density (ρ) is :

(A) $V = \sqrt{\frac{K + \left(\frac{4}{3}\right)\mu}{\rho}}$

(B) $V = \sqrt{\frac{K + \mu}{\rho}}$

(C) $V = \sqrt{\frac{K}{\rho}}$

(D) $V = \sqrt{\frac{K + \left(\frac{3}{4}\right)\mu}{\rho}}$

62. In Love waves the particle motion in the direction of propagation is described as :

(A) Vertical and parallel to it
(B) Horizontal and perpendicular to it
(C) Horizontal and parallel to it
(D) Vertical and perpendicular to it

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63. For an unstable gravimeter the zero length spring follows the law :
(A) Length is proportional to mass
(B) Length is inversely proportional to mass
(C) Change in length is proportional to mass
(D) Change in mass is proportional to length

64. If the point of observation is above mean sea level the free air correction is always :
(A) Multiplied by 0.0685 and added to the gravity
(B) Subtracted from the observed gravity
(C) Multiplied by 0.01276 and added to the gravity
(D) Added to the observed gravity

65. The components measured by AFMAG are :
(A) Inphase or tilt
(B) Out of Phase or ellipticity
(C) Ratio of inphase and ellipticity
(D) Apparent resistivity

66. The mutual impedance ratio $\left(\frac{z}{z_0}\right)$ nearly equal to :
(A) The ratio of the electrical and magnetic field components
(B) The ratio of the frequency and electrical permittivity
(C) The ratio of the secondary to the total field $\left(\frac{H_{sz}}{H_T}\right)$
(D) The ratio of the distance between current and magnetic sensors

67. A seismic wave is incident on a lower seismic impedance media then the reflected wave is out-of-phase by :
(A) 180° (B) 90°
(C) 360° (D) 0°

68. S/N of a group of 'n' geophones is enhanced by a factor of :
(A) n^2 (B) $\sqrt{n}$
(C) n! (D) 1/n

69. SP logging in oil well is carried out to locate boundaries between :
(A) Mud filtrate and shale
(B) Oil and gas
(C) Invaded zone and porous rocks
(D) Shale and porous strata

70. The Logging method that can be used in a cased borehole :
(A) Resistivity Logging (B) Induction Logging
(C) Calliper Logging (D) SP Logging

71. Ozone is a species of :
(A) N (B) O
(C) CO_2 (D) H_2O

72. Overturning of air mass under unstable conditions results in :
(A) Thunderstorms (B) Tornadoes
(C) Tropical storm (D) Turbulence

73. High clouds composed of ice crystals are called :
(A) Cirrus (B) Cumulus
(C) Nimbostratus (D) Altocumulus

74. When the Sun light strikes snow, the energy from the Sun is :
(A) Reflected by the snow
(B) Absorbed by the snow
(C) Transmitted to ground through snow
(D) Refracted by snow

75. A cool humid air mass that forms over icy cold north pacific and north Atlantic oceans is called :
(A) Continental Tropical
(B) Maritime polar
(C) Maritime Tropical
(D) Continental polar

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