

Test Booklet Code & Serial No.

प्रश्नपत्रिका कोड व क्रमांक

Paper-II

D

EARTH, ATMOSPHERIC, OCEAN AND PLANETARY SCIENCE

Signature and Name of Invigilator

Seat No.

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1. (Signature)

(In figures as in Admit Card)

(Name)

Seat No.

(In words)

2. (Signature)

(Name)

OMR Sheet No.

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(To be filled by the Candidate)

JUN - 35219

Time Allowed : 2 Hours]

[Maximum Marks : 200

Number of Pages in this Booklet : 16

Number of Questions in this Booklet : 100

Instructions for the Candidates

- Write your Seat No. and OMR Sheet No. in the space provided on the top of this page.
- This paper consists of 100 objective type questions. Each question will carry two marks. All questions of Paper II will be compulsory.
- At the commencement of examination, the question booklet will be given to the student. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as follows :
 - To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal or open booklet.
 - Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to missing pages/questions or questions repeated or not in serial order or any other discrepancy should not be accepted and correct booklet should be obtained from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given. The same may please be noted.
 - After this verification is over, the OMR Sheet Number should be entered on this Test Booklet.
- Each question has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.

Example : where (C) is the correct response.

A B C D
- Your responses to the items are to be indicated in the **OMR Sheet given inside the Booklet only**. If you mark at any place other than in the circle in the OMR Sheet, it will not be evaluated.
- Read instructions given inside carefully.
- Rough Work is to be done at the end of this booklet.
- If you write your Name, Seat Number, Phone Number or put any mark on any part of the OMR Sheet, except for the space 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.
- You have to return original OMR Sheet to the invigilator 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 duplicate copy of OMR Sheet on conclusion of examination.
- Use only Blue/Black Ball point pen.
- Use of any calculator or log table, etc., is prohibited.
- There is no negative marking for incorrect answers.

विद्यार्थ्यांसाठी महत्वाच्या सूचना

- परिक्षार्थींनी आपला आसन क्रमांक या पृष्ठावरील वरच्या कोपऱ्यात लिहावा. तसेच आपणांस दिलेल्या उत्तरपत्रिकेचा क्रमांक त्याखाली लिहावा.
- सदर प्रश्नपत्रिकेत 100 बहुपर्यायी प्रश्न आहेत. प्रत्येक प्रश्नास दोन गुण आहेत. या प्रश्नपत्रिकेतील सर्व प्रश्न सोडविणे अनिवार्य आहे.
- परीक्षा सुरु झाल्यावर विद्यार्थ्यांला प्रश्नपत्रिका दिली जाईल. सुरुवातीच्या 5 मिनीटांमध्ये आपण सदर प्रश्नपत्रिका उघडून खालील बाबी अवश्य तपासून घ्याव्यात.
 - प्रश्नपत्रिका उघडण्यासाठी प्रश्नपत्रिकेवर लावलेले सील उघडावे. सील नसलेली किंवा सील उघडलेली प्रश्नपत्रिका स्विकारू नये.
 - पहिल्या पृष्ठावर नमूद केल्याप्रमाणे प्रश्नपत्रिकेची एकूण पृष्ठे तसेच प्रश्नपत्रिकेतील एकूण प्रश्नांची संख्या पडताळून घ्यावी. पृष्ठे कमी असलेली/कमी प्रश्न असलेली/प्रश्नांचा चुकीचा क्रम असलेली किंवा इतर त्रुटी असलेली सदोष प्रश्नपत्रिका सुरुवातीच्या 5 मिनिटातच पर्यवेक्षकाला परत देऊन दुसरी प्रश्नपत्रिका मागवून घ्यावी. त्यानंतर प्रश्नपत्रिका बदलून मिळणार नाही तसेच वेळही वाढवून मिळणार नाही याची कृपया विद्यार्थ्यांनी नोंद घ्यावी.
 - वरीलप्रमाणे सर्व पडताळून पाहिल्यानंतरच प्रश्नपत्रिकेवर ओ.एम.आर. उत्तरपत्रिकेचा नंबर लिहावा.
- प्रत्येक प्रश्नासाठी (A), (B), (C) आणि (D) अशी चार विकल्प उत्तरे दिली आहेत. त्यातील योग्य उत्तराचा रकाना खाली दर्शविल्याप्रमाणे ठळकपणे काळा/निळ्या करावा.

उदा. : जर (C) हे योग्य उत्तर असेल तर.

A B C D
- या प्रश्नपत्रिकेतील प्रश्नांची उत्तरे ओ.एम.आर. उत्तरपत्रिकेतच दर्शवावीत. इतर ठिकाणी लिहिलेली उत्तरे तपासली जाणार नाहीत.
- आत दिलेल्या सूचना काळजीपूर्वक वाचाव्यात.
- प्रश्नपत्रिकेच्या शेवटी जोडलेल्या कोऱ्या पानावरच कच्चे काम करावे.
- जर आपण ओ.एम.आर. वर नमूद केलेल्या ठिकाणा व्यतिरीक्त इतर कोठेही नाव, आसन क्रमांक, फोन नंबर किंवा ओळख पटेल अशी कोणतीही खूण केलेली आढळून आल्यास अथवा असभ्य भाषेचा वापर किंवा इतर गैरमार्गाचा अवलंब केल्यास विद्यार्थ्यांला परीक्षेस अपात्र ठरविण्यात येईल.
- परीक्षा संपल्यानंतर विद्यार्थ्यांने मूळ ओ.एम.आर. उत्तरपत्रिका पर्यवेक्षकांकडे परत करणे आवश्यक आहे. तथापि, प्रश्नपत्रिका व ओ.एम.आर. उत्तरपत्रिकेची द्वितीय प्रत आपल्याबरोबर नेण्यास विद्यार्थ्यांना परवानगी आहे.
- फक्त निळ्या किंवा काळ्या बॉल पेनचाच वापर करावा.
- कॅलक्युलेटर किंवा लॉग टेबल वापरण्यास परवानगी नाही.
- चुकीच्या उत्तरासाठी गुण कपात केली जाणार नाही.

JUN - 35219/II—D

Earth, Atmospheric, Ocean and Planetary Science Paper II

Time Allowed : 120 Minutes]

[Maximum Marks : 200

Note : This Paper contains **Hundred (100)** multiple choice questions. Each question carrying **Two (2)** marks. Attempt *All* questions.

- | | |
|---|--|
| <p>1. The magma-ocean concept was developed to explain the petrology and geochemistry of :
 (A) Mars (B) Moon
 (C) Earth (D) Jupiter</p> <p>2. The general equation for a seismic wave velocity is :
 (A) $\sqrt{\left(\frac{\text{Elastic modulus}}{\text{density}}\right)}$
 (B) $\sqrt{\frac{\text{(Density)}}{\text{Time}}}$
 (C) $\frac{\text{Cycles}}{\text{Seconds}}$
 (D) $\left(\frac{\text{Shear Modulus}}{\text{Bulk Modulus}}\right)^2$</p> <p>3. The unaccreted gas and dust during the early planetary phase was blown away during :
 (A) T-Tauri phase
 (B) Nebular phase
 (C) Corona phase
 (D) S-Tauri phase</p> <p>4. One of the following temperature regimes was <i>not</i> recognized by Köppen :
 (A) Tropical (B) Desert
 (C) Mid-latitude (D) Polar</p> <p>5. In Köppen climate system "Am" climate is called tropical :
 (A) Desert (B) Steppe
 (C) Wet-and-dry (D) Monsoon</p> <p>6. In bio-geography edaphic factors are those factors that are related to :
 (A) Rocks (B) Landforms
 (C) Soils (D) Plant habitat</p> | <p>7. Match the following :
 A
 (a) Pools
 (b) Sapping
 (c) Barrier Spit
 (d) Stack
 B
 (1) Lagoon
 (2) Headland
 (3) Riffles
 (4) Groundwater
 Codes :
 (a) (b) (c) (d)
 (A) (3) (1) (4) (2)
 (B) (1) (2) (3) (4)
 (C) (3) (4) (1) (2)
 (D) (4) (3) (2) (1)</p> <p>8. Hydrograph shows change in with time.
 (A) Volume
 (B) Water level
 (C) Discharge
 (D) Velocity</p> <p>9. The groundwater in the Narmada valley and the hilly terrain in western and central India falls in this category of major hydrogeochemical provinces of India :
 (A) Bicarbonate Province
 (B) Bicarbonate-Chloride Province
 (C) Chloride Province
 (D) Bicarbonate-Chloride and Chloride Province</p> |
|---|--|

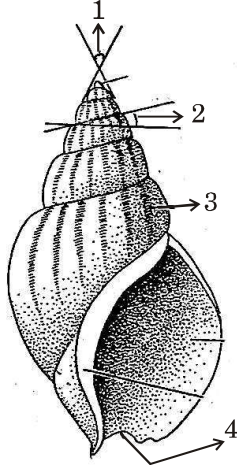
10. What is the specific capacity of a well that is pumping at 249 lpm, has a static water level at 5 m and pumping water level of 6.50 m ?
 (A) 166 lpm/meter of drawdown
 (B) 266 lpm/meter of drawdown
 (C) 373.5 lpm/meter of drawdown
 (D) 156 lpm/meter of drawdown
11. Which one of the following is the correct expression for Ghyben-Herzberg relation with respect to fresh water-seawater boundary.
 (A) For every meter of fresh water head above mean sea level the thickness of fresh water zone resting on the salt water is 14 metres
 (B) For every 40 metres of fresh water head above mean sea level the thickness of fresh water zone resting on the salt water is 40 metres
 (C) For every meter of fresh water head above mean sea level the thickness of fresh water zone resting on the salt water is 40 metres
 (D) For every 10 metres of fresh water head above mean sea level the thickness of fresh water zone above salt water is 40 metres
12. In basaltic rocks, alteration of the outer iron-rich rim of olivine produce brownish red mineral called :
 (A) Nephrite
 (B) Schorlomite
 (C) Iddingsite
 (D) Kaolinite
13. Magma undering extensive differentiation in $F_e^{tot}/(F_e^{tot} + MgO)$ ratio coincide with a minimal change in silica content resulting in crystallization of olivine and pyroxene without Fe-Ti oxides leads to formation of
 (A) N-MORB
 (B) E-MORB
 (C) Ferrobasalt
 (D) Fast-spreading EPR
14. microstructure is characterise as vermicular intergrowth of quartz and sodic-plagioclase, formed by replacement of K-feldspar in deformed granitic rocks.
 (A) Myrmekite
 (B) Migmatite
 (C) Metapeletic
 (D) Idioblastic
15. Which of the following igneous complex is *not* associated with Deccan Volcanic Province ?
 (A) Girnar
 (B) Phenaimata
 (C) Mundevara
 (D) Sittampundi

16. PGE are mostly associated with :
- (A) Felsic rocks
 - (B) Ultramafic rocks
 - (C) Intermediate rocks
 - (D) Mafic rocks
17. Mineral pigeonite typically occurs in the volcanic rocks because :
- (A) It is relatively light mineral and floats in magma
 - (B) At deeper conditions it exsolves into other pyroxenes
 - (C) At deeper levels pressure reduces the stability of pigeonite
 - (D) At deeper conditions it quickly reacts with other minerals
18. Melting of pure enstatite leads to :
- (A) Liquid of enstatitic composition
 - (B) Forsterite + liquid
 - (C) Fayalite + liquid
 - (D) Forsterite + fayalite + liquid
19. Presence of stishovite in a rock indicates :
- (A) Vicinity of divergent plate boundary
 - (B) Vicinity of volcanic caldera
 - (C) Vicinity of subduction zone
 - (D) Vicinity of meteoric impact crater
20. The group of clay minerals having 1 : 1 ratio of tetrahedral and octahedral components is :
- (A) Kaolinite
 - (B) Illite
 - (C) Smectite
 - (D) Vermiculite
21. Chrome garnet is termed as :
- (A) Almandine
 - (B) Grossularite
 - (C) Spessartite
 - (D) Uvarovite
22. The defining symmetry characteristics of the crystals belonging to the cubic system is :
- (A) Three axes of four-fold symmetry
 - (B) Four axes of three-fold symmetry
 - (C) Oblique and vertical minor planes
 - (D) Four axes of two-fold symmetry
23. For a series of points in a line and at zero height which are affected by the gravitational attraction exerted a buried sphere of density contrast 1.5 gm/cm^3 , the anomaly versus horizontal distance curve has a maximum of 4.526 mGal and a point of inflexion at 250 m from maximum. Calculate the depth of the point :
- (A) 500 meters
 - (B) 700 meters
 - (C) 400 meters
 - (D) 800 meters

24. A building is to be founded on a clay stratum. The water table is practically at ground surface level. Laboratory test shows that the unit weight of the soil is $\gamma = 20 \text{ kN/m}^3$ and classify the soil as a firm clay. The uniaxial compressive strength is $q_u = 150 \text{ kN/m}^2$. Supposing that the footing will be square, 2 m wide and the foundation depth will be 2 m below the ground surface. Calculate the ultimate bearing capacity :
- (A) 304.8 kPa
 (B) 403.9 kPa
 (C) 700.9 kPa
 (D) 502.6 kPa
25. terrains are represented as deep crustal rocks that have been technically exhumed of hot and dry magmatism.
- (A) Greenstone
 (B) Granulite
 (C) Gneiss
 (D) Metasedimentary
26. Ionization from cosmic rays and terrestrial sources produce small ions which makes the Earth Atmosphere :
- (A) Weakly electrically conductive
 (B) Strongly electrically conductive
 (C) Electrically neutral
 (D) Moderately electrically conductive
27. The atmosphere is positively charged with respect to the earth surface during :
- (A) Thunderstorm activity
 (B) Rainfall event
 (C) Fair weather condition
 (D) Lightning activity
28. In the momentum equation, the ratio of the advective term to the rotational term is the :
- (A) Prandtl number
 (B) Reynold number
 (C) Richardson number
 (D) Rossby number
29. Rossby waves depend fundamentally upon the variation of the Coriolis parameter with latitude, known as :
- (A) Alfa effect
 (B) Gamma effect
 (C) Beta effect
 (D) Lambda effect
30. Arrange the following formations into a north to south cross-section trend occurring within Central Indian Tectonic Zone :
- (a) Son-Narmada South fault
 (b) Sausar group
 (c) Mahakoshar group
 (d) Betul group
- (A) (a)—(b)—(c)—(d)
 (B) (a)—(c)—(b)—(d)
 (C) (d)—(b)—(a)—(c)
 (D) (c)—(a)—(d)—(b)

31. The cycle of Sunspot Maxima having the same polarity is referred to as the :
 (A) 11-year cycle
 (B) 22-year cycle
 (C) 7-year cycle
 (D) 5-year cycle
32. Temperature Kelvin scale contains :
 (A) Negative numbers
 (B) No positive numbers
 (C) No negative numbers
 (D) Zero
33. Entropy (ϕ) and potential temperature (θ) are related by the relation :
 (A) $\phi = C_p t_n \theta + \text{constant}$
 (B) $\phi = C_p e^\theta$
 (C) $\phi = C_p \theta + \text{constant}$
 (D) $\phi = C_p \sin \theta + \text{constant}$
34. The peak radiation from the sun is at 0.48 micrometer. What is the corresponding temperature of the sun ?
 (A) 6000 °K
 (B) 4897 °K
 (C) 3897 °K
 (D) 273 °K
35. In an isentropic process there is no change in :
 (A) Temperature
 (B) Heat
 (C) Volume
 (D) Pressure
36. The minimum temperature over tropical station occurs at :
 (A) Before sunrise
 (B) After sunrise
 (C) After sunset
 (D) Midnight
37. Richardson number is the Ratio of :
 (A) Stability and vertical wind shear
 (B) Stability and square of the vertical wind shear
 (C) Stability and Coriolis force
 (D) Vertical wind shear and Coriolis force
38. The angular velocity of the Earth is Ω , then the vorticity of the earth is :
 (A) Ω (B) 2Ω
 (C) 3Ω (D) $1/2 \Omega$
39. \bar{d} and γ are the dry adiabatic lapse rate and environmental lapse rate respectively. An unsaturated Air parcel is said to unstable, if :
 (A) $\bar{d} > \gamma$ (B) $\bar{d} = \gamma$
 (C) $\bar{d} < \gamma$ (D) $\bar{d} = 10 \gamma$
40. The total potential energy =
 (A) Internal Energy + Kinetic Energy
 (B) Internal Energy + Gravitational Potential Energy
 (C) Internal Energy - Kinetic Energy
 (D) Kinetic Energy + Gravitational Potential Energy

41. Consider the below given diagram of gastropod shell, identify the correct set of morphological terminologies :



- (A) 1-sutural angle, 2-spire angle, 3-rib, 4-siphonal canal
 (B) 1-spire angle, 2-rib, 3-sutural angle 4-aperture
 (C) 1-spire angle, 2-sutural angle, 3-rib, 4-siphonal canal
 (D) 1-spire angle, 2-sutural angle, 3-rib 4-columella
42. A structure that an animal possesses that serves no function, has a reduced function, or serves a different function than it did in its ancestors is termed as a(n) :
- (A) Extra appendage
 (B) Superfluous organ
 (C) Chromosomal aberration
 (D) Vestigial structure
43. In a petroleum well the bottom hole temperature at 3.2 km recorded 80°C. The mean surface temperature in the region is 25°C. What will be the geothermal gradient ?
- (A) 17.17°C/km
 (B) 07.17°C/km
 (C) 27.17°C/km
 (D) 37.17°C/km

44. of kerogen is the principal stage of oil formation.
- (A) Diagenesis
 (B) Metagenesis
 (C) Metamorphosis
 (D) Catagenesis
45. is the movement of petroleum from non-reservoir rocks to reservoir rocks.
- (A) Seepage
 (B) Primary migration
 (C) Secondary migration
 (D) Tertiary migration
46. Which one of the following factors does *not* affect the scale of aerial photograph ?
- (A) Focal length
 (B) Flying height
 (C) Ground elevation
 (D) Tilt
47. The coral provides following to the zooxanthellae in the symbiotic relationship.
- (A) Carbon dioxide
 (B) Oxygen
 (C) Nitrogen
 (D) Sugar
48. Phytoplanktons have extremely small diameter because :
- (i) it provides relatively high surface area to volume ratio.
 (ii) it attributes to frictional resistance to sinking.
 (iii) it helps in efficient uptake of nutrients.
 (iv) it helps to navigate efficiently in sea water.
- (A) Only (i), (ii) and (iii) are true
 (B) Only (i) and (iii) are true
 (C) All are true
 (D) Only (iii) is true

49. The formula to calculate the speed of wave or celerity (C) is :
(L = wavelength and T = wave period, H = wave height)
(A) $C = L/T$
(B) $C = T/L$
(C) $C = L \cdot T$
(D) $C = H/T$
50. One of the following is a barrier attached at one end to the mainland, with or without recurves, and backed by a bay, lagoon or marshland :
(A) Chenier ridge
(B) Beach Berm
(C) Fringing Reef
(D) Barrier spit
51. Identify the *correct* sequence of landform development on the head lands due to erosion :
(A) Cliff – cave – notch – stack – arch
(B) Cliff – cave – stack – notch – arch
(C) Cliff – notch – cave – arch – stack
(D) Stack – arch – cave – notch – cliff
52. Identify the *incorrect* statement :
(A) Semi-diurnal tides are characterized by two equal high tides and two equal low tides during a lunar day
(B) Spring tides are higher than normal high tides
(C) Neap tides are lower than normal low tides
(D) Neap tides occur twice a month when the moon is new or full
53. In the North Atlantic a clockwise circulation includes the North equatorial current the Gulf Stream and :
(A) Benguela
(B) Canaries
(C) Agulhas
(D) Oyashio
54. A narrow gap in an uplifted range or topographic feature through which water flows :
(A) Wind gap
(B) Dry valley
(C) Water gap
(D) Col
55. One of the following pairs of features does *not* include the products of weathering :
(A) Tafoni-saprolite
(B) Vertifacts-erratics
(C) Laterite-saprolite
(D) Tafoni-alveoli
56. A process which mainly contributes to the development of loess and stone pavements :
(A) Abrasion
(B) Caritaton
(C) Deflation
(D) Cavernous weathering
57. Streamlined parallel ridges aligned with, and typically tapering away from the direction of the prevailing wind :
(A) Deflation hollows
(B) Yardangs
(C) Drumlins
(D) Roche moutonnee

58. A deposit of unsorted material which has accumulated along the margins of a valley glacier :
- (A) Ground moraine
 - (B) Lateral moraine
 - (C) Terminal moraine
 - (D) End moraine

59. Match the following site investigation in-situ test on the rocks according to their characteristics :

Test

- (a) Schmidt Hammer test
- (b) Point load test
- (c) Till test
- (d) Pressuremeter test

Characteristics

- (1) It is carried out to assess deformation ability inside a borehole
- (2) It is carried out to estimate the angle of friction of discontinuities or basic angle of friction for smooth discontinuities to allow calculation of the residue angle of friction and joints roughness coefficients
- (3) Measures the strength index of rock sample classification and for correlation with uniaxial compressive strength of the rock
- (4) It is used to obtain an approximate estimation of uniaxial compressive strength of rocks

Codes :

- (a) (b) (c) (d)
- (A) (1) (4) (3) (2)
- (B) (2) (1) (4) (3)
- (C) (3) (2) (1) (4)
- (D) (4) (3) (2) (1)

60. Match the following :

List I

- (a) Stock works
- (b) Saddle reefs
- (c) Ladder veins
- (d) Gash veins

List II

- (1) Mineralisation along the creasts of anticline
- (2) Transverse and roughly parallel fraction filled with the ore
- (3) An interlacing network of small ore-bearing veinlets
- (4) Small wedge-shaped fissures filled with the ore

Codes :

- (a) (b) (c) (d)
- (A) (2) (1) (3) (4)
- (B) (1) (2) (3) (4)
- (C) (3) (1) (2) (4)
- (D) (4) (3) (2) (1)

61. In which of the following areas does Iron ore deposit occur ?

- (A) Rudrasagar
- (B) Zawar
- (C) Kudremukh
- (D) Dariba

62. Porphyry copper deposits are associated with :

- (A) Mid oceanic ridges
- (B) Subduction zones
- (C) Continental rifts
- (D) Back arc basins

63. Diamond in kimberlite and corundum in nepheline syenite are the good examples of :
 (A) Segregation deposits
 (B) Dissemination deposits
 (C) Injection deposits
 (D) Pegmatitic deposits
64. Banded black coloured coal that contains lower amounts of volatile, moisture and have higher carbon content can be classified as :
 (A) Anthracite
 (B) Bituminous coal
 (C) Bone coal
 (D) Lignite
65. Correctly match the regional stratigraphic sequence of the Western Dharwar Craton :
A
 (a) Sargur Group
 (b) Gorur gneiss
 (c) Closepet granite
B
 (1) 3.3 – 3.4 Ga
 (2) 3.3 – 3.1 Ga
 (3) 2.5 – 26 Ga
Codes :
 (a) (b) (c)
 (A) (2) (1) (3)
 (B) (1) (2) (3)
 (C) (1) (3) (2)
 (D) (2) (3) (1)
66. The typical record of the early crust of ultramafic high Fe-Mg rocks depicting upto 500°C hotter mantle are :
 (A) Eclogite
 (B) Pegmatite
 (C) Anorthosite
 (D) Komatiites
67. The cimmerician orogeny characterizes for :
 (A) Opening up of Pacific Ocean
 (B) Opening up of Paleotethys
 (C) Closure of Neotethys
 (D) Closure of Paleotethys
68. Thrusting and folding of sediments in the Himalaya appears to have caused a crustal shortening of the order of :
 (A) 10,000 km
 (B) 2,400 km
 (C) 1,000 km
 (D) 500 m
69. When the strain rate is related to stress through a non-linear relationship, it is described as :
 (A) Plastic deformation
 (B) Elastic deformation
 (C) Viscous strain
 (D) Non-linear deformation
70. A bed parallel elongation giving rise to tectonic thinning is characteristic of :
 (A) Extensional fault
 (B) Thrust fault
 (C) Normal fault
 (D) Buckle fault

71. Considering the two-dimensional stress, (σ), the normal stresses are expressed as and the shear stresses are
- (A) σ_{xy} and σ_{yz} ; σ_{xz} and σ_{yz}
 (B) σ_{xx} and σ_{yy} ; σ_{xy} and σ_{yx}
 (C) σ_{xy} and σ_{yx} ; σ_{xx} and σ_{yy}
 (D) σ_{xz} and σ_{yz} ; σ_{xy} and σ_{yx}
72. Which one of the following stable isotopic ratio is used for estimation of palaeotemperature of sea water ?
- (A) $^{13}\text{C}/^{12}\text{C}$
 (B) $^{18}\text{O}/^{16}\text{O}$
 (C) $^{87}\text{Sr}/^{86}\text{Sr}$
 (D) $^{15}\text{N}/^{14}\text{N}$
73. Isotopes are the elements having :
- (A) Same N but different Z and A
 (B) Same Z but different N and A
 (C) Same A but different Z and N
 (D) Same N, Z and A
74. The separation between arrival times of P and S wave with distance and the ratio of P and S wave with distance.
- (A) Decrease, increase
 (B) Increase, decrease
 (C) Remain same, decrease
 (D) Increase, remain same
75. The half-life of ^{238}U is 4468×10^6 years and ^{235}U is 704×10^6 years. The ratio $^{235}\text{U}/^{238}\text{U}$ in a metamorphosed sample is 0.007257. Given that the ratio was 0.4 at the time of formation, calculate the metamorphosed sample age.
- (A) 4.8×10^6 years
 (B) 4.8×10^9 years
 (C) 4.8×10^3 years
 (D) 4.8×10^7 years
76. Rb-Sr age based on the individual minerals often yield younger age than that of the whole rock age. The reason for this is :
- (A) The whole rock gives enough sample to date the rock accurately
 (B) The whole rock contains more ^{87}Kb than the individual minerals
 (C) Individual minerals have a higher closure temperature and diffusion of Sr atoms is not random at smaller scale (~ a few meters)
 (D) Individual minerals have a lower closure temperature and diffusion of Sr atoms is random at smaller (~ a few meters) scale
77. The value of 'g' (acceleration due to gravity) at a place varies with time due to which of the following :
- (A) Isostatic rebound
 (B) The topography of the continents
 (C) Lateral differences in the compositions of rocks
 (D) The Earth's rotation

78. Identify the *correct* statements from the following :
- (i) Proton precession magnetometer measures the total field
 - (ii) Fluxgate magnetometer measures the total field
 - (iii) Fluxgate magnetometer measures a Component of the field
 - (iv) Proton precession magnetometer measures component of the field
- (A) (i) and (iv) (B) (ii) and (iv)
 (C) (i) and (iii) (D) (iii) and (iv)
79. Bouguer correction is applied to correct for the gravity anomaly due to mass between station location and
- (A) Mohorovicic discontinuity
 - (B) Base of upper crust
 - (C) Mean sea level
 - (D) Local datum plane
80. Six electrode configuration, termed axial parallel, perpendicular, Radial, Azimuthal and equatorial spreads are associated with which of the following array.
- (A) Wenner array
 - (B) Schlumberger array
 - (C) Dipole array
 - (D) Lee-Partitioning
81. At a point on the Earth at height 1000 m, the observed value of gravity is 979700 mGal. The value at sea level is 980000 mGal. Calculate the Bouguer anomalies :
- (A) -1046 gu
 - (B) -4443 gu
 - (C) -5246 gu
 - (D) -7013 gu
82. The peculiar structure of a particular type of nodular anhydrite that consists of slightly elongated, irregular polygonal masses of anhydrite separated by thin dark stringers of carbonate or clay minerals is referred to as :
- (A) Mesh wire structure
 - (B) Framboydal frame structure
 - (C) Chickenwire structure
 - (D) Both (A) and (B) are correct
83. Which of the following groups of rock formations is 'NOT' arranged from older to younger ?
- (A) Semri-Kaimur-Rewa-Bhander
 - (B) Talchir-Damuda-Panchat-Mahadeva
 - (C) Jurio-Jumara-Jhuran-Bhuj
 - (D) Uttature-Trichinopoly-Ariyalore-Niniyur

84. The correct chronological order (older to younger) of the following stratigraphic units is :
 P : Talchir Tillite
 Q : Muth Quartzite
 R : Umia Ammonite Bed
 S : Umaria Marine Bed
 (A) P-R-S-Q (B) Q-P-S-R
 (C) R-Q-P-S (D) P-Q-R-S
85. This is the current epoch of the quaternary as is known as Oxygen Isotope Stage 1 :
 (A) Cenozoic (B) Neogene
 (C) Pleistocene (D) Holocene
86. In Phi(ϕ) grain size scale :
 (a) Increasing absolute value of negative Phi numbers indicate increasing millimetre size
 (b) Increasing positive Phi numbers indicate decreasing millimetre size
 (c) Increasing positive Phi numbers indicate increasing millimeter size
 (d) Increasing absolute value of negative Phi numbers indicate decreasing millimeter size
 (A) (a), (b) (B) (c), (d)
 (C) (d), (a) (D) (b), (c)
87. Brown cathodoluminescence colour of quartz is suggestive of provenance.
 (A) Plutonic quartz
 (B) Pegmatitic
 (C) Volcanic
 (D) Regionally metamorphosed rock
88. The temperature at the centre of the earth is estimated to be reaching to :
 (A) 10,000°C (B) 12,000°C
 (C) 8,000°C (D) 4,500°C
89. The main energy source for the geodynamo is :
 (A) Mantle convection
 (B) Thermal convection
 (C) Rotational friction
 (D) Radioactivity
90. Which one of the following is the earliest formed mineral condensate in the early solar system ?
 (A) Corundum
 (B) Forsterite
 (C) Anorthite
 (D) Enstatite
91. The fundamental formula to calculate the moment magnitude of an earthquake is :
 (A) Slip \times Area \times Density
 (B) Area \times Rupture \times Young's modulus
 (C) Elastic modulus \times Rigidity \times Velocity
 (D) Slip \times Area \times Elastic modulus
92. One of the following features is *not* associated with strike-slip fault :
 (A) Beheaded Valley
 (B) Sag pond
 (C) Hog back
 (D) Shutter ridge

93. Aggradation :
- (A) Leads to lowering of stream channel elevation
 - (B) Reduces the slope of the river channel
 - (C) Leads to raising of the stream channel elevation
 - (D) Results into deepening of river channel
94. Match the following :
- List-I**
- (a) Carbonation
 - (b) Hydrolysis
 - (c) Chelation
 - (d) Hydration
- List-II**
- (1) The addition of water to the molecular structure of a mineral
 - (2) The reaction of minerals with dissolved CO₂ in water
 - (3) The incorporation of cations from the mineral into organic compounds
 - (4) The decomposition and reaction with water
- Codes :**
- (a) (b) (c) (d)
 - (A) (4) (3) (2) (1)
 - (B) (2) (4) (3) (1)
 - (C) (2) (3) (4) (1)
 - (D) (4) (2) (1) (3)
95. A graph that shows the relationship between the size of sediment and the threshold flow velocity required to erode it, transport it and deposit it :
- (A) Hjulstrom curve
 - (B) Flow duration curve
 - (C) Sediment rating curve
 - (D) Trombe's curve
96. The peeling away of layers or sheets of rock from exposed rock surface is :
- (A) Exhumation
 - (B) Exfoliation
 - (C) Insolation
 - (D) Chelation
97. Which one of the following gives the strongest evidence that the moon is derived from the earth.
- (A) Proximity of the moon to the earth
 - (B) Both the moon and earth have basaltic crust
 - (C) Both have similar oxygen isotopic composition
 - (D) Silicate-earth and silicate-moon have similar SiO₂ and MgO content
98. Earthquake shadow zone exists because :
- (A) The outer core is liquid
 - (B) The seismic waves do not follow the Snell's law at the core-mantle boundary
 - (C) D¹¹ layer at the core-mantle boundary
 - (D) The inner core is solid
99. The long wavelength geoid of the Earth is controlled by density variation in :
- (A) Crust
 - (B) Deep mantle
 - (C) Core
 - (D) Inner core
100. The surface samples of moon are remarkably depleted in :
- (A) Non-volatile elements
 - (B) Volatile elements
 - (C) Refractory elements
 - (D) Refractory trace metals

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ROUGH WORK