

Test Booklet Code &amp; 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)

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Seat No. ....

2. (Signature) .....

(In words)

(Name) .....

OMR Sheet No.

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**SEP - 35221**

(To be filled by the Candidate)

**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.

**विद्यार्थ्यासाठी महत्वाच्या सूचना**

- परिक्षार्थींनी आपला आसन क्रमांक या पृष्ठवरील 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 सुरू झाल्यावर विद्यार्थ्याला प्रश्नपत्रिका दिली जाईल. सुरुवातीच्या 5 मिनीटांमध्ये आपण सदर प्रश्नपत्रिका उघडून खालील बाबी अवश्य तपासून पहाव्यात.
  - प्रश्नपत्रिका उघडण्यासाठी प्रश्नपत्रिकेवर लावलेले सील उघडावे. सील नसलेली किंवा सील उघडलेली प्रश्नपत्रिका स्विकारू नये.
  - पहिल्या पृष्ठवर नमूद केल्याप्रमाणे प्रश्नपत्रिकेची एकूण पृष्ठे तसेच प्रश्नपत्रिकेतील एकूण प्रश्नांची संख्या पडताळून पहावी. 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/निळा 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 कोन्या पानावरच कच्चे काम करावे.
- जर आपण ओ.एम.आर. वर नमूद केलेल्या ठिकाणा व्यतिरिक्त इतर कोठेही नाव, आसन क्रमांक, फोन नंबर किंवा ओळख पटेल अशी कोणतीही खूण केलेली आढळून आल्यास अथवा असभ्य भाषेचा वापर किंवा इतर गैरमार्गांचा अवलंब केल्यास विद्यार्थ्याला परीक्षेस अपात्र ठरविण्यात येईल.
- परीक्षा संपल्यानंतर विद्यार्थ्याने 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.

**SEP - 35221/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.

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| <ol style="list-style-type: none"> <li>1. Which of the following ways of measuring the size of an earthquake does not need an instrumental record ?<br/>(A) Richter Magnitude<br/>(B) Mw<br/>(C) Moment<br/>(D) Intensity</li> <li>2. If an earthquake 'A' has a Richter magnitude of 7 and 'B' that of 6. Then :<br/>(A) A is '10' times more intense than B<br/>(B) A is '28' times intense than B<br/>(C) A is '5' times intense than B<br/>(D) A is 1000 times intense than B</li> <li>3. A seismic 'P' wave making a complete traverse from crust, mantle, core and back to crust is denoted as :<br/>(A) PMCMP<br/>(B) PKIKP<br/>(C) <math>P_m P_c P_{Ic} P_m P_c</math><br/>(D) <math>P_n I_n P_n P_s</math></li> </ol> | <ol style="list-style-type: none"> <li>4. The orbital radius of a planet sweeps out equal areas in equal intervals of time is stated by :<br/>(A) Newton's law<br/>(B) Bode's law<br/>(C) Kepler's law<br/>(D) Doppler effect</li> <li>5. The value for average density of the earth is derived from measurement of :<br/>(A) Acceleration due to gravity<br/>(B) Density of rocks of earth composition<br/>(C) Planetary accretion<br/>(D) Matter inside the earth</li> <li>6. The topography and gravity field of Mars indicate that its crust is :<br/>(A) Out of hydrostatic equilibrium<br/>(B) In hydrostatic equilibrium<br/>(C) Of uniform thickness<br/>(D) Uniformly thin</li> <li>7. Most sensitive instrument for magnetic survey is :<br/>(A) Optically pumped magnetometer<br/>(B) Proton precession magnetometer<br/>(C) Magnetic field balance<br/>(D) Fluxgate magnetometer</li> </ol> |
|--|---|

8. With which type of wave the phenomenon of compression and rarefaction is associated ?  
 (A) P-waves (B) S-waves  
 (C) Core waves (D) K-waves
9. Match the following Resistivity curve types :
- I**
- (a)  $P_1 > P_2 < P_3$  High-Low-High  
 (b)  $P_1 < P_2 < P_3$  Low-Low-High  
 (c)  $P_1 < P_2 > P_3$  Low-High-Low  
 (d)  $P_1 > P_2 > P_3$  High-Low-Low
- II**
- (i) Q type  
 (ii) A type  
 (iii) K type  
 (iv) H type
- Codes :**
- (A) (a) – (iv), (b) – (ii), (c) – (iii), (d) – (i)  
 (B) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)  
 (C) (a) – (i), (b) – (ii), (c) – (i), (d) – (ii)  
 (D) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (ii)
10. In which of the following methods of electrical resistivity exploration, all four electrodes are placed in a line, but the distance between current electrodes is maintained equal to or more than five times the distance between potential electrodes ?  
 (A) Wenner configuration  
 (B) Dipole-Dipole array  
 (C) Schlumberger configuration  
 (D) Orellana-money configuration
11. Speed of the P-waves is the highest among which of the following rocks/phases ?  
 (A) Water (B) Shale  
 (C) Basalt (D) Peridotite
12. Identify the correct statements from the following :
- (a) Evaporation from a soil surface nearly equals the evaporation from a free water surface only as long as the soil surface remains saturated with water  
 (b) The maximum amount of water the soil can hold against the force of gravity is termed the field capacity  
 (c) The lowest amount of moisture that is held by the soil which is not available for transpiration by vegetation is the wilting point  
 (d) The difference between the field capacity and the wilting point is the available soil moisture
- (A) Only (a), (b), (c) are correct  
 (B) Only (b), (c), (d) are correct  
 (C) Only (a) and (b) are correct  
 (D) (a), (b), (c), (d) are correct



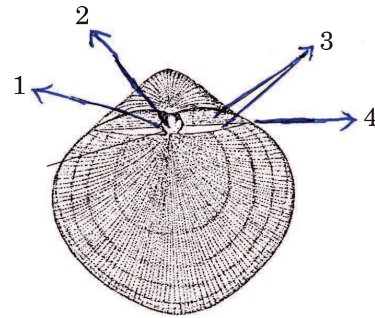
13. Identify the *correct* statements from the following :  
The storage coefficient of an aquifer is :
- Attributable to compressibility of the aquifer skeleton and the pore water
  - Attributable to the compressibility of the aquifer skeleton and expansibility of the pore water
  - Attributable to the expansibility of the aquifer skeleton and the pore water
  - The volume of water released or taken into storage from a vertical column of aquifer of unit cross-sectional area due to unit change in piezometric head
- (b) and (a)
  - (a) and (c)
  - (a) and (d)
  - (b) and (d)
14. The ratio of transmissivity to the coefficient of storativity of an aquifer is defined by the term ..... .
- Hydraulic conductivity
  - Hydraulic gradient
  - Hydraulic viscosity
  - Hydraulic diffusivity
15. Which of the following is associated with Kaladgi Basin ?
- Badami Group
  - Indravati Group
  - Chitravati Group
  - Semri Group
16. The highly folded and partly denuded ancient mica-schists, phyllites and slates of Kumaon-Garhwal Himalayas named as :
- Haimanta system
  - Vaikrita system
  - Jutogh series
  - Salkhalas
17. Which of the following sequences is the correct order of appearance in the geological history of Earth :
- Fishes–Flowering plants–Whales–Dinosaurs
  - Flowering plants–Fishes–Whales–Dinosaurs
  - Fishes–Dinosaurs–Flowering plants–Whales
  - Fishes–Dinosaurs–Whales–Flowering plants
18. Match the following textures with their characteristic crystal size :
- Texture**
- Glassy
  - Aphanitic
  - Phaneritic
  - Cumulate
- Characteristic Crystal size**
- Fine grained rocks
  - Coarse grained rocks
  - Early crystalizing mineral from a matrix of interlocking euhedral grains
  - Rapidly cooling with no crystal
- Codes :**
- (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii)
  - (a) – (i), (b) – (iv), (c) – (ii), (d) – (iii)
  - (a) – (iii), (b) – (iii), (c) – (ii), (d) – (ii)
  - (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)

19. A ..... is a pipe-like body of breccia composed of fragments that are mainly derived from the neighboring country rock and also has rocks from stratigraphically higher and lower level mantle origin.  
 (A) Maars (B) Tuffisite  
 (C) Diatreme (D) Stock
20. At the highest pressure of blueschist facies, a jadeite pyroxene may form from albite making the beginning of the transition to ..... facies.  
 (A) Greenschist (B) Amphibolite  
 (C) Eclogite (D) Granulite
21. An ultrabasic rock consisting of phenocrysts of olivine and minor pyroxene in a groundmass of diopside and kalsilite with small amounts of perovskite, olivine and biotite :  
 (A) Kimberlite (B) Pyroxenite  
 (C) Mafurite (D) Katungite
22. The extrusive igneous rock that contains calcium-rich plagioclase, feldspathoid, olivine and pyroxene are termed as :  
 (A) Nephelinite (B) Basanite  
 (C) Coppaelite (D) Basalt
23. Mylonite in which grain growth has occurred either during or after the deformation, such mylonite are termed as .....  
 (A) Blastomylonite  
 (B) Blastophitic  
 (C) Diactextite  
 (D) Granoblastic
24. Although minor constituents of the average mantle, presence of these oxides change the mineralogy of mantle :  
 (A)  $\text{Al}_2\text{O}_3$ , CaO and  $\text{Na}_2\text{O}$   
 (B)  $\text{K}_2\text{O}$ ,  $\text{P}_2\text{O}_5$  and CaO  
 (C)  $\text{Pb}_3\text{O}_4$ ,  $\text{Fe}_2\text{O}_3$  and  $\text{TiO}_2$   
 (D)  $\text{Al}(\text{OH})$ ,  $\text{H}_2\text{O}$  and  $\text{Na}_2\text{O}_3$
25. Match the following rock types with their essential mineral composition :  
**Rock**  
 (a) Monzonite  
 (b) Norite  
 (c) Picrite  
 (d) Rhyolite  
**Essential Mineral**  
 (i) Potash feldspar + plagioclase  
 (ii) Labrodorite + orthopyroxene (enstatite, hypersthene, bronzite)  
 (iii) Olivine + augite + Calc-plagioclase  
 (iv) Quartz + alkali feldspar > plagioclase  
**Codes :**  
 (A) (a) – (ii), (b) – (iii), (c) – (i), (d) – (iv)  
 (B) (a) – (iii), (b) – (ii), (c) – (iv), (d) – (i)  
 (C) (a) – (iv), (b) – (i), (c) – (iii), (d) – (ii)  
 (D) (a) – (i), (b) – (ii), (c) – (iii), (d) – (iv)
26. The main synoptic hours are :  
 (A) 00 and 12.00 UTC  
 (B) 03.00 and 09.00 UTC  
 (C) 00 and 06.00 UTC  
 (D) 06.00 and 12.00 UTC

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| <p>27. The total electrical resistance for a unit area of the Atmospheric column from the earth surface to the ionosphere is called :</p> <p>(A) Columnar resistance<br/>(B) Columnar potential<br/>(C) Columnar field<br/>(D) Columnar conductivity</p> <p>28. Ice-particles only ..... microwave radiation.</p> <p>(A) deflect (B) adsorb<br/>(C) absorb (D) scatter</p> <p>29. Marshall and Palmer (1948) have suggested a relation to determine the droplet size distribution from the :</p> <p>(A) Liquid water path<br/>(B) Liquid water content<br/>(C) Rainfall rate<br/>(D) Cloud thickness</p> <p>30. The triple point for water is ..... at a pressure of 6.11 hPa (mb).</p> <p>(A) 303°K (B) 273°K<br/>(C) 293°K (D) 283°K</p> <p>31. According to Dvorak classification T3.5 represents :</p> <p>(A) Tropical Depression<br/>(B) Tropical Cyclone<br/>(C) Cat 1 Hurricane<br/>(D) Cat 2 Hurricane</p> | <p>32. Which group of the following are referred as high clouds ?</p> <p>(A) Stratus, Stratocumulus, Nimbostratus<br/>(B) Cirrus, Cirrostratus, Cirrocumulus<br/>(C) Altostratus, Altopumulus<br/>(D) Cumulus, Cumulonimbus</p> <p>33. Steam fog and frontal fog, form as the :</p> <p>(A) Water evaporates and mixes with drier air<br/>(B) Air cools and mixes with drier air<br/>(C) Air warms and mixes with drier air<br/>(D) Air circulate and mixes with drier air</p> <p>34. Convection represents the vertical movement of :</p> <p>(A) Warmer air upward and cooler air downward<br/>(B) Cooler air upward and warmer air downward<br/>(C) Warmer air downward<br/>(D) Cooler air upward</p> <p>35. The merging of cloud droplets by collision is called :</p> <p>(A) Nucleation (B) Condensation<br/>(C) Coalescence (D) Collision</p> <p>36. The idea in cloud seeding experiment is to find clouds that have too low a ratio of ice crystals to droplets and then to add enough artificial ice nuclei to reach the ratio of crystals to droplets of about ..... for producing precipitation.</p> <p>(A) 1 : 1000 (B) 1 : 1,00,000<br/>(C) 1 : 10 (D) 1 : 500</p> |
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37. When ice crystals collide with supercooled liquid droplets, upon contact, the liquid droplets freeze into ice and stick to the ice crystal. A process is called :
- (A) Bergeron process  
(B) Accretion  
(C) Coalescence  
(D) Nucleation
38. Visibility of the atmosphere is :
- (A) The greatest distance an observer can see  
(B) The greatest distance an observer cannot see  
(C) The shortest distance an observer can see  
(D) The shortest distance an observer cannot see
39. Which of the following is *not* Dispersive wave ?
- (A) Rossby wave  
(B) Deep water gravity wave  
(C) Shallow water gravity wave  
(D) Inertia wave
40. The amount of water vapor in unit volume of moist air is known as :
- (A) Specific Humidity  
(B) Absolute Humidity  
(C) Relative Humidity  
(D) Humidity Mixing Ratio

41. Consider the given diagram of upper surface of brachiopod shell, choose the *correct* set of 5 morphological terms.



P–Nototherium

Q–Hinge

R–Cardinal process

S–Delthyrium

T–Inter area

- (A) 1–P, 2–Q, 3–S, 4–R  
(B) 1–S, 2–R, 3–T, 4–Q  
(C) 1–Q, 2–S, 3–R, 4–P  
(D) 1–S, 2–Q, 3–T, 4–P
42. Which of the following microfossils is commonly used in biostratigraphic correlation of Palaeozoic marine strata ?
- (A) Angiosperm Pollen  
(B) Diatoms  
(C) Chitinozoans  
(D) Dinoflagellates

43. A clean and dry core sample weighing 425 gram was 100% saturated with a 1.07 specific gravity brine. The new weight is 453 gram. The core sample is 12 cm long and 4 cm in diameter. The percentage of porosity of the rock sample will be ..... .  
 (A) 07.00% (B) 17.30%  
 (C) 27.30% (D) 25.00%
44. In this mode of sediment transport, particles are lifted a few grain diameters into the flow and are transported downstream in ballistic trajectories before impact on the bed :  
 (A) Suspension (B) Saltation  
 (C) Sliding (D) Rolling
45. In Köppen climate system “BS” climate is called :  
 (A) Desert (B) Steppe  
 (C) Wet-and-dry (D) Monsoon
46. One of the following is *not* one of the major biomes :  
 (A) Desert (B) Tundra  
 (C) Forest (D) Woodland
47. Match the following :  
 (a) Planar shear surface  
 (b) Shear plane is concave-up  
 (c) Valley margin creep  
 (d) Debris mass of volcanic material  
 (i) Lahar  
 (ii) Translational slide  
 (iii) Colluvium  
 (iv) Rotational slide  
**Codes :**  
 (a) (b) (c) (d)  
 (A) (i) (ii) (iii) (iv)  
 (B) (iv) (iii) (ii) (i)  
 (C) (ii) (iii) (iv) (i)  
 (D) (ii) (iv) (iii) (i)
48. One of the following parameters is *not* included in the estimation of the mean flow velocity :  
 (A) Hydraulic radius  
 (B) Channel slope  
 (C) Manning roughness coefficient  
 (D) Kinematic viscosity
49. Geostationary satellites are placed at ..... altitude from the earth’s surface.  
 (A) 26,000 km. (B) 30,000 km.  
 (C) 36,000 km. (D) 44,000 km.
50. To adapt to the changing salinity of esturine environment crabs :  
 (A) Allow their body fluid to change with the salinity of the water  
 (B) Move towards the fresh water side  
 (C) Move towards the sea water side  
 (D) Via active transport keep the salt concentration of their bodies more or less constant
51. Seaweeds, mussels, barnacles and lichens typically indicate :  
 (A) rocky inter-tidal environment  
 (B) coral reef environment  
 (C) soft-bottom intertidal environment  
 (D) continental slope environment
52. .... is an index of the ratio between the sum of the lengths of core fragments longer than 10 cm and the total length of the core run.  
 (A) Uniaxial compressive test  
 (B) Brazilain test  
 (C) Point load test  
 (D) Rock quality designation

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| <p>53. One of the following mountains is <i>not</i> in Europe :</p> <p>(A) Pyrenees      (B) Alps<br/>(C) Atlas          (D) Carpathians</p> <p>54. Podzolization is common in :</p> <p>(A) Warm and humid climates<br/>(B) Cool and moist climates<br/>(C) Warm and dry climates<br/>(D) Cool and dry climates</p> <p>55. One of the following is <i>not</i> a karst feature :</p> <p>(A) Doline          (B) Kettle hole<br/>(C) Sink hole      (D) Uvala</p> <p>56. The fan-shaped system of distributive and anastomosing channels developed on the side of a natural levee :</p> <p>(A) Debris Cone<br/>(B) Crevasse-splay<br/>(C) Fan delta<br/>(D) Meanderscroll</p> <p>57. In one of the following types of mass movements, the movement is essentially vertical and downward and there is little or no horizontal component :</p> <p>(A) Landslide      (B) Creep<br/>(C) Subsidence    (D) Mudflow</p> <p>58. In Dunham's (1962) classification of limestone ..... represents limestone containing more than 10% grains in carbonate mud.</p> <p>(A) Wackestone    (B) Packstone<br/>(C) Mudstone      (D) Boundstone</p> | <p>59. .... is a type of cross bedding which is characterised by oppositely dipping directions of foreset laminae in adjacent sediment layers.</p> <p>(A) Lenticular bedding<br/>(B) Flaser bedding<br/>(C) Herringbone cross bedding<br/>(D) Hummocky cross bedding</p> <p>60. Mark the <i>correct</i> statement regarding deposition of pyrite :</p> <p>(A) It is deposited in a reducing environment<br/>(B) It is deposited under both acid and alkaline conditions<br/>(C) It is deposited in oxidising environment under both acid and alkaline conditions<br/>(D) It is deposited in a reducing environment under both acid and alkaline conditions</p> <p>61. Identify the <i>correct</i> sequence of mass movements on the basis of increasing rate of movement :</p> <p>(A) Solifluction—creep—rock fall—debris flow<br/>(B) Solifluction—debris flow—rock fall—earth flow<br/>(C) Creep—rotational landslide—debris flow—rock fall<br/>(D) Creep—rotational landslide—rock fall—solifluction</p> <p>62. A river will develop braided channel pattern due to significant :</p> <p>(A) Increase in the amount of coarse sediment load<br/>(B) Decrease in the amount of coarse sediment load<br/>(C) Increase in channel sinuosity<br/>(D) Decrease in wash load</p> |
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| <p>63. Which one of the following is <i>not</i> one of the chemical weathering processes ?</p> <p>(A) Hydrolysis<br/>(B) Oxidation<br/>(C) Ice crystal growth<br/>(D) Carbonic acid reaction</p> <p>64. Soil profiles preserved over long periods of time but which are not being actively developed today are known as :</p> <p>(A) Palaeosols    (B) Lignite beds<br/>(C) Solum            (D) Histosols</p> <p>65. True or False :</p> <p><b>I.</b> If a fault displaces the surface of the ground so that one side is higher or lower than the other, a monoclinical scarp results.</p> <p><b>II.</b> Tectonic scarps with height, steepeners and lateral continuity comparable to fault scarp are formed by steep monoclines.</p> <p>(A) I is True and II is false<br/>(B) I is False and II is True<br/>(C) Both I and II are True<br/>(D) Both I and II are False</p> | <p>66. .... is the level in the ocean where rate of dissolution of carbonate balances the rate of accumulation.</p> <p>(A) Transition layer<br/>(B) Calcite compensation depth<br/>(C) Carbonate critical depth<br/>(D) Lysocline</p> <p>67. The group of coal macerals derived from plant secretions is known as :</p> <p>(A) Inertinite    (B) Leptynite<br/>(C) Vitrinite    (D) Secrinite</p> <p>68. Diamonds are explored in :</p> <p>(A) Kimberlites and Lamproites<br/>(B) Komatiites<br/>(C) Spilites<br/>(D) Anorthosites</p> <p>69. Banded iron formations in the Archaean greenstone belts are best witness for :</p> <p>(A) Archaean sedimentary basin development<br/>(B) Shift from anoxic to oxygenated environments<br/>(C) Archaean cratons<br/>(D) Archaean weathering process</p> <p>70. Which one of the following is an ore of platinum group of elements (PGE) ?</p> <p>(A) Sperrylite    (B) Digenite<br/>(C) Diopside    (D) Bornite</p> |
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71. Polymetallic nodules on the ocean floor contain significant amounts of :  
 (A) U–Th–Nb (B) Pb–Zn–Ti  
 (C) Cu–Ni–Co (D) Hg–Mo–Pt
72. Arrange *correctly* the following continental assembly according to ages :  
 (a) Ur 1. ~3.0 Ga  
 (b) Nena 2. ~1.5 Ga  
 (c) Rodina 3. ~1.8 Ga  
 (A) (a) – 1, (b) – 2, (c) – 3  
 (B) (a) – 3, (b) – 2, (c) – 1  
 (C) (a) – 2, (b) – 1, (c) – 3  
 (D) (a) – 1, (b) – 3, (c) – 2
73. The Palghat-Cauvery shear zone comprises :  
 (A) Charnokite interbanded with khondalites  
 (B) TTG with dolerites  
 (C) Greenstone belts  
 (D) Khondalites interbanded with Anorthosites
74. Any stress tensor can be split into two symmetric matrices, where the first part represents the mean stress and the second is called :  
 (A) Axial stress  
 (B) Deviatoric stress  
 (C) Non-axial stress  
 (D) Dialative stress
75. When a body is subjected to a change in hydrostatic stress, the volume change per unit pressure change is called :  
 (A) Compressibility  
 (B) Lithostatic pressure  
 (C) Isostatic stress  
 (D) Hydrostatic deformation
76. In dextral shear, transtension results in ..... rotation of the extension axis and transpression results in ..... rotation.  
 (A) Linear, Compressional  
 (B) Anticlockwise, Clockwise  
 (C) Clockwise, Anticlockwise  
 (D) Compressional, Linear
77. In spherical coordinates, with spherical geometry, the rate of decrease of pressure ( $p$ ) with radius ( $r$ ) is given by, ( $g$  = acceleration due to gravity;  $\rho$  = density) :  
 (A)  $\frac{dp}{dr} = \rho + g$  (B)  $\frac{dp}{dr} = \sqrt{\rho g}$   
 (C)  $\frac{dp}{dr} = -\rho \cdot g$  (D)  $\frac{dp}{dr} = \rho \cdot g^2$
78. The development of Gondwana land assembly, coinciding with ..... orogeny, took place during ..... through fusion of .....  
 (A) Pan-African, 500-600 Ma, East and West  
 (B) Hercinian, 450 Ma, East and West  
 (C) Variscan, 1000–12000 Ma, North and South  
 (D) Columbian, 300–500 Ma, East and West



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| <p>79. The Neotethys ocean opened during Early Permian as a result of rifting of ..... with Indian continent.</p> <p>(A) Variscan Terranes<br/>(B) Hindukush Terranes<br/>(C) Cimmerian Terranes<br/>(D) Russian Continent</p> <p>80. Match the following structural trends with their regional orientation :</p> <p>(a) Dharwar (1) ENE – WSW Trend<br/>(b) Satpura (2) NW – SE Trend<br/>(c) Aravali (3) NE – SW Trend</p> <p>(A) (a) – 2, (b) – 1, (c) – 3<br/>(B) (a) – 1, (b) – 2, (c) – 3<br/>(C) (a) – 2, (b) – 1, (c) – 2<br/>(D) (a) – 3, (b) – 2, (c) – 1</p> <p>81. Which one of the following methods is best suited for dating highly deformed and metamorphosed Archaean gneissic rocks containing multiple age components ?</p> <p>(A) Whole rock U-Pb dating<br/>(B) Single zircon dating<br/>(C) Whole rock Pb–Pb dating<br/>(D) Carbon dating</p> <p>82. Which one of the following lunar materials shows positive europium anomaly ?</p> <p>(A) KREEP<br/>(B) Anorthosite<br/>(C) Apollo 11 Hi-K Basalt<br/>(D) Apollo 11 Quartz Tholeiite</p> | <p>83. Amongst the following, which mineral phase has highest condensation temperature ?</p> <p>(A) Enstatite (B) Magnetite<br/>(C) Corundum (D) Anorthite</p> <p>84. Which one of the following rocks generates the maximum amount of heat by radioactive decay ?</p> <p>(A) Chondritic meteorite<br/>(B) Peridotite<br/>(C) Granite<br/>(D) Dolerite</p> <p>85. Along which one of the following boundaries there is no change in chemical composition ?</p> <p>(A) Upper mantle and lower mantle<br/>(B) Crust and mantle<br/>(C) Core and mantle<br/>(D) Oceanic plate and lower horizon</p> <p>86. In the deep ocean the circulation is caused by density variations due to difference in :</p> <p>(A) Temperature and water depth<br/>(B) Temperature and salinity<br/>(C) Water depth and salinity<br/>(D) Sea surface temperature and air temperature</p> |
|---|---|

87. Match the following :

**I**

- (a) A zone in the water column where the vertical change of salinity is relatively sharp
- (b) A zone having a marked change in water density as a function of water depth
- (c) Water having much higher salinity than normal water
- (d) A physio-chemical process whereby clay particles in seawater aggregate into a clump or cluster

**II**

- (i) Flocculation
- (ii) Brine
- (iii) Pycnocline
- (iv) Halocline

**Codes :**

- (a) (b) (c) (d)
- (A) (i) (ii) (iii) (iv)
- (B) (i) (iv) (iii) (ii)
- (C) (ii) (iv) (i) (iii)
- (D) (iv) (iii) (ii) (i)

88. Identify the *correct* answer regarding wave refraction :

- (A) It equally distributes energy on headlands and across bays
- (B) It does not determine the distribution of energy along the non-linear coast characterized by headlands and bays
- (C) It concentrates energy on headlands and disperses it across bays
- (D) It concentrates energy in the bays and disperses it on headlands

89. Ebb current :

- (A) It is seaward flow of tidal current
- (B) It is landward flow of tidal current
- (C) It is not a type of tidal current
- (D) It is a type of current in inland lakes

90. Match the following :

**I**

- (a) The flat accumulation of sand on a beach above the high tide line
- (b) A wave that is unstable and collapses at the shoreline
- (c) A steep wave that moves upriver during the flooding tide
- (d) Net drift of sand along a zig-zag path on the beach

**II**

- (i) Beach drift
- (ii) Breaker
- (iii) Berm
- (iv) Bore

**Codes :**

- (a) (b) (c) (d)
- (A) (iii) (ii) (iv) (i)
- (B) (iii) (iv) (ii) (i)
- (C) (i) (ii) (iv) (iii)
- (D) (iii) (ii) (i) (iv)

91. Piezo-electric effect is observed in quartz because :

- (A) All bonds are of equal strength in quartz
- (B) Quartz belongs to hexagonal system
- (C) Quartz lacks center of inversion (i)
- (D) Quartz crystallises at the lowest temperature in the Bowen's reaction series

92. Which one of the following compositions correctly represents forsterite ?  
 (A)  $(\text{MgFe})_2 \text{SiO}_3$   
 (B)  $\text{MgSiO}_4$   
 (C)  $\text{FeSiO}_4$   
 (D)  $(\text{MgFe}) \text{SiO}_4$
93. Which one of the following minerals exhibits negative magnetic susceptibility ?  
 (A) Pyroxene (B) Quartz  
 (C) Olivine (D) Biotite
94. Match the following :  
**I**  
 (1) Carlsbad twin  
 (2) Bevenno twin  
 (3) Manebach twin  
 (4) Swallow-tails  
**II**  
 (i) Twin plane (010)  
 (ii) Twin plane (021)  
 (iii) Twin plane (001)  
 (iv) Twin plane (100)  
**Codes :**  
 (A) 1 – i, 2 – ii, 3 – iii, 4 – iv  
 (B) 1 – iii, 2 – i, 3 – ii, 4 – iv  
 (C) 1 – iv, 2 – i, 3 – iii, 4 – ii  
 (D) 1 – i, 2 – iii, 3 – iv, 4 – ii
95. Dravite is a :  
 (A) Ca-pyroxene  
 (B) Mg-tourmaline  
 (C) Fe-tourmaline  
 (D) Mg-augite
96. At a point on the Earth at height 1000 m, the observed value of gravity is 979700 mGal. At sea level it is 980000 mGal. Calculate the free-air anomaly.  
 (A) 78 gu (B) 38 gu  
 (C) 52 gu (D) 86 gu
97. Analysis of coal in which the assay of moisture, ash, volatile matter and fixed carbon is determined by standard test method is known as :  
 (A) Thermal shock  
 (B) Proximate  
 (C) Ultimate  
 (D) Assay
98. Consider a spherical earth of radius 6000 km and surface velocity of 6 km/sec, with a velocity distribution of the type  $v(r) = a / \sqrt{r}$ . At the distance reached by a wave emerging at a take-off angle of  $45^\circ$  from a focus on the surface. Calculate the interval between the arrival time of the direct P- and reflected PP-waves (the PP-wave is one that is reflected at the surface at the midpoint between the focus and the point of observation) :  
 (A) 58 seconds (B) 69 seconds  
 (C) 78 seconds (D) 97 seconds
99. The magnetic inclination,  $I$  and magnetic latitude,  $\lambda$  are related by :  
 (A)  $\tan I = \tan \lambda$   
 (B)  $\tan I = 2 \tan \lambda$   
 (C)  $\tan I = \frac{1}{2} \tan \lambda$   
 (D)  $\tan I = \tan 2\lambda$
100. The magnetic field at the equator, compared to that at the pole is :  
 (A) 4 times (B) Twice  
 (C) The same (D) Half

**SEP - 35221/II—D**

**ROUGH WORK**