| Signature and Name of Invigilator       Seat No.         1. (Signature)       (In figures as in Admit Card)         (Name)       (In figures as in Admit Card)         2. (Signature)       (In figures as in Admit Card)         3. (Signature)       (In words)         JUDN - 352200       (In words)         Time Allowed : 2 Hours]       (In words)         Number of Pages in this Booklet : 20       Number of Questions in this Booklet : 100         Number of Pages in this Booklet : 20       Number of Questions in this Booklet : 100         Number of Pages in this Booklet : 20       Number of Questions in this Booklet : 100         1. This paper constate of 100 objective type questions. Each question at the words of this page.       Image and the student. In the first 5 minutes, you are represented at the student. In the first 5 minutes, you are represented at the student and opplace of question in the booklet with the informating printed on the averghed at correct booklet with the informating printed on the averghed at correct to page and number of question in the core pages and number of question in the core traposes gained each due to the averghed at correct traposes agained each due.         (I) The have average to the averghed at correct traposes agained each due.       Image averdifier and the average traped application the core pages and the babels obstep without sticker seaso to the Question booklet.         (I) The have average to the average traped application the core page average traped application the core pages of this babels.  | Test ]<br>प्रश्नप<br>Pa]<br>EARTH, ATMOSPHERIC, OCE  | Booklet Code & Serial No.<br>त्रिका कोड व क्रमांक<br>per-II<br>CAN AND PLANETARY SCIENCE   |
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| <ol> <li>(Signature)</li></ol>   | Signature and Name of Invigilator  | Seat No.   |
| <ul> <li>(Name)</li> <li>2. (Signature)</li> <li>(Name)</li> <li>(Seat No.</li> <li>(In words)</li> <li>(JUN - 355220</li> <li>Time Allowed : 2 Hours]</li> <li>(To be filled by the Candidate)</li> <li>(In words)</li> <li>(In words)</li> <li>(Maximum Marks: 200</li> <li>Number of Pages in this Booklet : 20</li> <li>Number of Pages in this Booklet : 20</li> <li>Number of Questions in this Booklet : 100</li> <li>To brave scales of the Candidate</li> <li>(In words)</li> <li>(In the state of the super pages and nuthe gauge of the cover page. Do nate of the cover pages and nuthe of opension in the infert and in a state of the cover page. And words the order the cover page. Do nate of the cover pages and nuthe of pages and nuthe infering that ward the infert and infert an</li></ul>  | 1. (Signature)   | (In figures as in Admit Card   |
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| <ul> <li>Time Allowed : 2 Hours]</li> <li>Number of Pages in this Booklet : 20</li> <li>Number of Pages in this Booklet : 20</li> <li>Number of Questions in this Booklet : 100</li> <li>Uncertained for the Conditates</li> <li>This paper ronaits of 100 objective type questions. Each question will early two marks. All questions of Paper II will be compulsory.</li> <li>At the commencement of examination, the question booklet and compulsority examines. The question of Paper II will be compulsory.</li> <li>This paper readity to other student. In the first 5 minutes, you are requested to open the booklet and compulsority examines.</li> <li>The have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet with the information printed on the cover page. Paulty booklets due to missing pages/questions or questions repeated or not in serial order or any other discremany should not be accepted and order or any extra this werification is over, the OMR Sheet Number, booklet should be obtained from the invigilator within the period of minites. After warks, neither the Question Booklet, will be replaced for in accept and order or any extra time will be given. The same may please be toold.</li> <li>Met the is verification is over, the OMR Sheet Number. Booklet will be replaced for integrame the circle as indicated below other the circle as indicated below other the inter due the booklet.</li> <li>The work is to be done at the end of this booklet.</li> <li>My wurke your Name, Seat Number, Phone Number or pup any mark on any mark to any grant, it will not except and for the OMR Sheet, it will not be evaluated in the OMR Sheet, it will not be evaluated in the order bis booklet.</li> <li>My wurke your Name, Seat Number, Phone Number or pup any marks, which any discless evaluation or negative in any other work is to be done at the ord of this booklet.</li> <li>My wurke your Name, Seat Number, Phone Number or pup any marks t</li></ul>  | JUN - 35220  | (To be filled by the Candidate)  |
| <ul> <li>Number of Pages in this Booklet : 20</li> <li>Number of Questions in this Booklet : 100</li> <li>Instructions for the Candidates</li> <li>Instruction for the Candidates</li> <li>Instructions f</li></ul>   | Time Allowed : 2 Hours]  | [Maximum Marks : 20  |
| <ol> <li>Instructions for the Candidates</li> <li>Write your Seat No. and OMR Sheet No. in the space provided<br/>on the top of this page.</li> <li>This paper consists of 100 objective type questions. Each question<br/>will carry two marks. All questions of Paper II will be compulsary.</li> <li>At the commencement of examination printed on the object will the inferst 6 minutes, you are<br/>requested to open the booklet and compulsarily examine it a<br/>follows:</li> <li>To have access to the Question Booklet,<br/>(i) Tally the number of pages and number of questions in<br/>the booklet with the information printed on the ocver<br/>page. Faulty booklets due to missing pages/questions<br/>or questions repeated or not he invigitative within<br/>the period of 5 minutes. Afterwards, neither the Question<br/>Booklet will be obtained from the invigitative within<br/>the period of 0. No have a careful within within<br/>the ord of the relevant entries, which may disclose you<br/>identify, or use abaves and the ot one at the end of the booklet<br/>and wint a careful within with within the direce in the NORE<br/>Sheet given inside the Booklet.</li> <li>Your responses to the itimes are to be indicated in the OMR<br/>Sheet given inside the Booklet and thy within the within<br/>any mark on any part of the OMR Sheet, except for the space<br/>allotted for the relevant entries, which may disclose you<br/>identify, or use</li></ol> | Number of Pages in this Booklet : <b>20</b>  | Number of Questions in this Booklet : 10   |
| <ul> <li>5. Your responses to the items are to be indicated in the OMR<br/>Sheet given inside the Booklet only. If you mark at any place<br/>other than in the circle in the OMR Sheet, it will not be evaluated.</li> <li>6. Read instructions given inside carefully.</li> <li>7. Rough Work is to be done at the end of this booklet.</li> <li>8. If you write your Name, Seat Number, Phone Number or put<br/>any mark on any part of the OMR Sheet, except for the space<br/>allotted for the relevant entries, which may disclose your<br/>identity, or use abusive language or employ any other unfair<br/>means, you will render yourself liable to disqualification.</li> <li>9. You have to return original OMR Sheet to the invigilator at the<br/>end of the examination compulsorily and must not carry it with<br/>you outside the Examination.</li> <li>10. Use only Blue/Black Ball point pen.</li> <li>11. Use of any calculator or log table, etc., is prohibited.</li> <li>12. 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(A)       (B)       (D)   | विद्यार्थ्यांसाठी महत्त्वाच्या सूचना           1.         परिक्षार्थींनी आपला आसन क्रमांक या पृष्ठवरील वरच्या कोप-यात लिहा           तसेच आपणांस दिलेल्या उत्तरापत्रिकेचा क्रमांक त्याखाली लिहावा.         २.           2.         सदर प्रश्नपत्रिकेत 100 बहुपर्यायी प्रश्न आहेत. प्रत्येक प्रश्नास दोन र<br>आहेत. या प्रश्नपत्रिकेत 100 बहुपर्यायी प्रश्न आहेत. प्रत्येक प्रश्नास दोन र<br>आहेत. या प्रश्नपत्रिकेत ति सर्व प्रश्न सोडविणे अनिवार्य आहे.           3.         परीक्षा सुरू झाल्यावर विद्यार्थ्याला प्रश्नपत्रिका दिली जाईल. सुरुवातीच्य<br>मिनीटांमध्ये आपण सदर प्रश्नपत्रिका उघडून खालील बाबी अवश्य तपा<br>पहाव्यात.           4.         प्रश्नपत्रिका उघडण्यासाठी प्रश्नपत्रिकेवर लावलेले सील उघड<br>सील नसलेली किंवा सील उघडलेली प्रश्नपत्रिका स्विकारू न<br>(ii)           पृष्ठिल्या पृष्ठवर नमूद केल्याप्रमाणे प्रश्नपत्रिका स्विकारू न<br>(iii)         पहिल्या पृष्ठवर नमूद केल्याप्रमाणे प्रश्नपत्रिका सिल कारू न<br>(iii)           पृष्ठे कमी असलेली/कमी प्रश्न असलेली/प्रश्नांचा चुकीचा छ<br>असलेली किंवा इतर त्रुटी असलेली सदोष प्रश्नपत्रिका सुरुवाती<br>5 मिनिटातच पर्यवेक्षकाला परत देऊन दुसरी प्रश्नपत्रिका माग<br>घ्यावी. त्यानंतर प्रश्नपत्रिका बदलून मिळणार नाही तसेच वेठ<br>वाढवून मिळणार नाही याची कृपया विद्यार्थ्या ने तरेच प्रश्नपत्रिक<br>ओ.एम.आर. उत्तरपत्रिकेचा नंबर लिहावा.           4.         प्रत्वेक प्रश्नसाठी (A), (B), (C) आणि (D) अशी चार विकल्प उत्तरे दि<br>आहेत. त्यातील योग्य उत्तराचा रकाना खाली दर्शविल्याप्रमाणे ठळक<br>काळा/निळा करावा. |
| <ul> <li>6. Read instructions given inside carefully.</li> <li>7. Rough Work is to be done at the end of this booklet.</li> <li>8. 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.</li> <li>9. 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.</li> <li>10. Use only Blue/Black Ball point pen.</li> <li>11. Use of any calculator or log table, etc., is prohibited.</li> <li>12. There is no negative marking for incorrect answers.</li> <li>and the end of 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.</li> <li>9. You have to return original OMR Sheet to the invigilator at the end of the examination.</li> <li>and the examination compulsorily and must not carry it with you outside the Examination.</li> <li>and the examination.</li> <li>b. You have to return original OMR Sheet on conclusion of examination.</li> <li>b. Use of any calculator or log table, etc., is prohibited.</li> <li>c. There is no negative marking for incorrect answers.</li> <li>b. Ant must not 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.</li> <li>9. You have to return original OMR Sheet on conclusion of examination.</li> <li>10. Use of any calculator or log table, etc., is prohibited.</li> <li>12. There is no negative marking for incorrect answers.</li> <li>13.</li></ul>   | 5. Your responses to the items are to be indicated in the <b>OMF</b><br><b>Sheet given inside the Booklet only.</b> If you mark at any place<br>other than in the circle in the OMP Short it will not be evaluated   | R<br>e<br>5. या प्रश्नपत्रिकेतील प्रश्नांची उत्तरे ओ.एम आर उत्तरपत्रिकेतच दर्शवार्व  |
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| 11.       Use of any calculator or log table, etc., is prohibited.         12.       There is no negative marking for incorrect answers.   | 10. Use only Blue/Black Ball point pen.  | 10. אינט ויושטו ואישו אושטי שוני איז שו ש טואי אינטוי<br>11 מהמצע אינט אינט אינט אינט אינט אינט אינט אינט  |
| 12. There is no negative marking for incorrect answers.  | 11. Use of any calculator or log table, etc., is prohibited.   | 12. चुकीच्या उत्तरासाठी गुण कपात केली जाणार नाही.  |
|  | 12. There is no negative marking for incorrect answers.  |  |

JUN - 35220/II—D

## Earth, Atmospheric, Ocean and Planetary Science Paper II

# Time Allowed : 120 Minutes][Maximum Marks : 200Note : This Paper contains Hundred (100) multiple choice questions. Each question

carrying Two (2) marks. Attempt All questions. 1. Find the odd one : The characteristic assemblage of 4. granulite facies is : (A) Scree (B) Talus (A) Omphacite-Garnet-Lawsonite (C) Colluvium (B) Hornblende-Plagioclase-garnet (D) Till (C) Scapolite-plagioclase-quartz 2. ..... are found in (D) Orthopyroxene-plagioclasecontinental collision, at the base of garnet crustal cross-section, continentalscale thrust fault that expose deep 5. The ..... and ..... crust and as xenoliths sampled from were times of major reef building. the lower crust by alkali-basalts. (A) Silurian, Devonian (A) Albite-epidote hornfels (B) Cambrian, Ordovician (B) Greenschist (C) Ordovician, Silurian (C) Granet granulite (D) Mississipian, Pennsylvanian (D) Eclogite Metaperidotite composed of olivine 3. 6. ..... zone is a body of and pyroxene wholly or partially strata in which the maximum converted to ..... at abundance of a particular species is subduction zones with interaction found, though not its total range. with sea water. (A) Range zone (A) Rodingite (B) Acme zone (B) Sericite (C) Assemblage zone (C) Serpentine (D) Kaolinite (D) Concurrent zone

7. Match the following stratigraphic units listed in Group I with the precambrian basins in Group II :

## Group I

- (a) Badami Group
- (b) Kheinjua Fm
- (c) Sullavai Group
- (d) Papaghani Group

## Group II

- (P) Vindhyan
- (Q) Chhattisgarh
- (R) Kaladgi
- (S) Cuddapah
- (T) Pranahita Godavari

## Codes :

- $(a) \quad (b) \quad (c) \quad (d)$
- $(A) \ (R) \ (P) \ (T) \ (S)$
- (B) (P) (T) (S) (R)
- (C) (R) (Q) (T) (S)
- (D) (P) (Q) (R) (T)
- 8. Diagram where the horizontal and vertical axes represent the normal  $(\sigma_n)$  and shear  $(\sigma_s)$  stresses that act on planes through a point are known as :
  - (A) Fry diagram
  - $(B) \ \phi \text{-diagram}$
  - (C) Mohr diagram
  - (D) Kinematic flow diagram

- 9. Which one of the following minerals melts incongruently ?
  - (A) Forsterite
  - (B) Pyrite
  - (C) Anorthite
  - (D) Quartz
- 10. Akermanite is an example of :
  - (A) Cyclosilicate
  - (B) Tectosilicate
  - (C) Sorosilicate
  - (D) Nesosilicate
- 11. Glaucophane is a :
  - (A) Calcic amphibole
  - (B) White mica
  - (C) Magnesium amphibole
  - (D) Alkali amphibole
- 12. Which one of the following does *not* control the interference colour of a mineral section observed under petrological microscope ?
  - (A) Orientation of section with respect to the crystallographic axis
  - (B) Thickness of the thin section
  - (C) Orientation of the vibration directions of e-rays and o-rays with respect to that of polariser and analyser
  - (D) Intensity of light

- 13. The *d*-spacing of a plane (110) of a cubic crystal with lattice parameter a = 5 Å is :
  - (A) 0.28 Å
  - (B) 2.5 Å
  - (C) 3.54 Å
  - (D) 7.07 Å
- 14. The variety of picrific basalt having abundant olivine (20-50 volume %) and less frequent augite phenocrysts with the groundmass of augite, olivine and plagioclase is called :
  - (A) Oceanite
  - (B) Diabase
  - (C) Kimberlite
  - (D) Ankaramite
- 15. The mafic rocks high in both magnesium and silica concentration and are thought to be usually formed in fore-arc environments, typically during the early stages of subduction are called :
  - (A) Komatiites
  - (B) Kimberlites
  - (C) Boninites
  - (D) Lamproites
- 16. Intrusive igneous rock that is composed essentially of nepheline and an alkali pyroxene, usually aegirine-augite is called :
  - (A) Wehrlite
  - (B) Harzburgite
  - (C) Limburgite
  - (D) Ijolite

- 17. .....is a microstructure of glassy basaltic rocks characterised by radiating aggregates of fibrous crystal.
  - (A) Vugh
  - (B) Vesicle
  - (C) Variolitic
  - (D) Tiktites
- 18. A texture consisting of large crystal of quartz with mosaic substructure surrounded by a fine-grained aggregate of quartz, are termed as ...... texture.
  - (A) Mortar
  - (B) Diaphoresis
  - (C) Phyllonite
  - (D) Reaction rims
- 19. The Dharwar craton have experienced a regional metamorphism from north towards south grading into :
  - (A) Green Schist Blue Schist -Barovian
  - (B) Green Schist Amphibolite Granulite
  - (C) Amphibolite granulite -Eclogite
  - (D) Barovian Amphibolite -Granulite

- - (A) Rn, Bi, As
  - (B) Hg, Zn
  - (C) Mn, Mo
  - (D) As, Te, Au
- 21. Measurement of ..... and ..... of the rocks is essential to calculate the heat flux.
  - (A) temperature, gradient
  - (B) heat transfer and gradient
  - (C) rheology and thermal conductivity
  - (D) temperature gradient and thermal conductivity
- 22. In our solar system, the region near Neptune and beyond is known as :
  - (A) Kuiper belt
  - (B) Kepler's belt
  - (C) Planetary ocean
  - (D) Oort nebula
- 23. The moment of inertia of the Earth is derived from :
  - (A) Density variation
  - (B) Precession of the equinoxes
  - (C) Observations from moon
  - (D) Seismic wave propagation

- 24. The fastest and slowest stretching directions are fixed at ...... to the shear plane for progressive simple shear.
  - (A) 45°
  - (B) 0°
  - (C) 90°
  - (D) 0 to  $30^{\circ}$
- 25. Material that flows as perfectly viscous, but only above a certain yield stress is called :
  - (A) Newtonian material
  - (B) Kelvinian material
  - (C) Bingham material
  - (D) Prahl material
- 26. A pervasive parallel foliation of finegrained, platy minerals in a direction perpendicular to the direction of maximum finite shortening by deformation and low grade metamorphism is called :
  - (A) Foliation
  - (B) Slaty cleavage
  - (C) Schistocity
  - (D) S-Tectonite
- 27. Tsunami is a shallow water gravity wave. A Tsunami has occurred over the ocean at a distance of about 1100 km from the coast. After how much time will it reach the coast ?
  - (A) 1 hour
  - (B) 1 hour 30 minutes
  - (C) 2 hours
  - (D) 2 hours 30 minutes

- 28. Conditions favorable for the formation of fog are :
  - (A) RH 80%, cloudy sky, light wind, atmosphere unstable
  - (B) RH 80%, cloudy sky, wind calm, atmosphere unstable
  - (C) RH 80%, clear sky, light wind, atmsophere unstable
  - (D) RH 80%, clear sky, light wind, atmosphere stable
- 29. ..... maintains the ionospheric potential (Vi) of approximately ~ + 300 kV with respect to the Earth surface.
  - (A) Monsoonal rainfall activity
  - (B) Cyclonic and anti-cyclonic activity
  - (C) Thunderstorm and lightning activity
  - (D) Earthquake and Tsunami
- 30. The ratio of backscattering to the extinction coefficient for Rayleigh molecule is a constant of :
  - (A) 1.5
  - (B) < 1
  - (C) > 2
  - (D) Zero

- 31. Near the equator, the North-east trade winds converge with the South-east trade winds along a boundary called the :
  - (A) Subtropical convergence zone
  - (B) Intertropical convergence zone
  - (C) Polar convergence zone
  - (D) Extratropical convergence zone
- 32. The global mean pressure at the surface of the Earth is :
  - (A) 984 mb
  - (B) 1013 mb
  - (C) 950 mb
  - $(D) \ 1000 \ mb$
- 33. In the polar regions the net radiation throughout the year remains :
  - (A) Positive
  - (B) Negative
  - (C) Zero
  - (D) Constant

- 34. In the tropics the net radiation throughout the year is :
  - (A) Positive
  - (B) Negative
  - (C) Zero
  - (D) Constant
- 35. Which sub-division of Maharashtra receives the highest amount of rainfall during the South-west Monsoon Season ?
  - (A) Vidarbha
  - (B) Madhya Maharashtra
  - (C) Konkan
  - (D) Marathwada
- 36. The Dry Adiabatic Lapse Rate is :
  - (A)  $6.5^{\circ}$  K/km
  - (B) 5.8° K/km
  - (C)  $9.8^{\circ}$  K/km
  - (D) 1.6° K/km
- 37. Easterly Jet stream over the IndianPeninsular Region is observedduring the :
  - (A) Winter season
  - (B) Pre-Monsoon season
  - (C) South-west Monsoon season
  - (D) Post-Monsoon season

- 38. The solar constant is 1367 Watt/m<sup>2</sup> but the average amount of energy incident on level surface outside the atmosphere is only :
  - (A)  $1/8^{th}$  of it
  - (B)  $1/4^{th}$  of it
  - (C) 1/2 of it
  - (D) 1/6<sup>th</sup> of it
- 39. North-east Monsoon gives rainfall over :
  - (A) North-east India
  - (B) Tamil Nadu
  - (C) Maharashtra
  - (D) Jammu and Kashmir
- 40. In a Barotrophic atmosphere :
  - (A) Geostrophic wind speed increases with height
  - (B) Geostrophic wind speeddecreases with height
  - (C) Geostrophic wind does not change with height
  - (D) Pressure is a function of temperature only

41. Consider the diagram of adapical surface of cedaroid morphology. Choose the *correct* set of 5 morphological terms.



- (A) 1-ambularum, 2-interamulacrum, 3-ocular plate, 4-genital plate, 5-aboral pole
- (B) 1-ambulacrum, 2-interambulacrum, 3-genital plate, 4-ocular plate, 5-aboral pole
- (C) 1-interambulacrum, 2-ambulacrum, 3-genital plate, 4-ocular plate, 5-aboral pole
- (D) 1-interambulacrum, 2-ambulacrum, 3-aboral pole, 4-ocular plate, 5-genital plate

- 42. The first group of jawed fish to radiate extensively were the :
  - (A) Ostracoderms
  - (B) Placoderms
  - (C) Cephalaspidomorphs
  - (D) Anaspids
- 43. The bottomhole temperature of a hydrocarbon gas reservoir is 140°F. What will be the amount of water expansion, per unit volume, that will occur when the pressure is decreased from 4000 psi to 3270 psi. (Given, estimated compressibility of water at 4000 psi is  $2.8 \times 10^{-6}$ psi<sup>-1</sup>).
  - (A) 4.02
  - (B) 3.02
  - (C) 2.02
  - (D) 1.02

- 44. A well drilled for petroleum exploration recorded 80°C temperature at the depth of 3.2 km. Its formation temperature at a depth of 1800 meters will be ......
  - (A) 85.9°C
  - (B) 55.9°C
  - (C) 65.9°C
  - (D)  $75.9^{\circ}C$
- 45. The organic matter constituents are listed below :
  - (a) Protein (up to 50% or more)
  - (b) Lipids (5 to 25%)
  - (c) Carbohydrates (not more than 40%)
  - (*d*) Lignins (25%)

Which of the above are true for organic matter of marine origin from Petroleum source rock context ?

- (A) (a), (b), (c)
- (B) (a), (c), (d)
- (C) (c), (a), (d)
- (D) (d), (b), (a)

- 46. ..... deposits are formed from cloud of ash that move out horizontally from a vent at hurricane velocities following a volcanic explosion.
  - (A) Air-fall
  - (B) Solfataras
  - (C) Blister
  - (D) Surge
- 47. Animals from ..... environment display little evolutionary change.
  - (A) coral reef
  - (B) deep-sea
  - (C) rock inter-tidal
  - (D) lagoonal
- 48. Important environmental factor that affects the type of organism in estuary is :
  - (A) type of sediment
  - (B) salinity
  - (C) sunlight
  - (D) temperature

49. Match the following site investigation in-situ test on the soil according to their characteristic parameter :

## Test

- (a) Standard Penetration Test
- (b) Probing Penetration Test
- (c) Cone Penetration Test
- (d) Field Vane Test

## **Characteristic Parameters**

- (i) Measures the soils reaction to the continuous hydraulic insertion of a cone into the ground
- (ii) It is dynamic penetration test carried out inside borehole on granular soil
- (*iii*) To determine the undrained shear strength of soft cohesive soils
- (*iv*) It estimate soils penetration resistance according to depth.

## **Codes** :

|     | ( <i>a</i> ) | ( <i>b</i> ) | ( <i>c</i> ) | (d)          |  |
|-----|--------------|--------------|--------------|--------------|--|
| (A) | (ii)         | ( <i>i</i> ) | (iv)         | (iii)        |  |
| (B) | (iii)        | (iv)         | (ii)         | ( <i>i</i> ) |  |
| (C) | (ii)         | (iv)         | ( <i>i</i> ) | (iii)        |  |
| (D) | (iv)         | (ii)         | (i)          | (iii)        |  |

- 50. One of the following is the greatest reservoir of carbon :
  - (A) Soil
  - (B) Terrestrial biomass
  - (C) Atmosphere
  - (D) Deep ocean
- 51. A natural levee is :
  - (A) formed by fluvial erosion
  - (B) built during periods of overbank flooding
  - (C) present only in the mountainous terrain
  - (D) absent along meandering rivers
- 52. Accelerated soil erosion is *not* associated with :
  - (A) Expansion of rills
  - (B) Expansion of gullies
  - (C) Increased sediment load in streams
  - (D) Increase in the thickness of soil profile
- 53. One of the following rivers has *not* developed a megafan :
  - (A) Kosi
  - (B) Gandak
  - (C) Chambal
  - (D) Son

- 54. In the Thar desert of India one of the following is the most common and widespread sand dune type :
  - (A) Barchan
  - (B) Star
  - (C) Parabolic
  - (D) Sief
- 55. Match the metalogenic terms of Column I with their descriptions given in Column II :

## Column I

- (a) Syngenetic
- (b) Hypogene
- (c) Epigenetic
- (d) Supergene

#### **Column II**

- (P) Ores and minerals formed at the same time as their host rocks
- (Q) Ore formation by descending solutions
- (R) Ores emplaced into pre-existing rocks of any origin
- (S) Ores formed by ascending solutions
- (T) Concentration caused by processes in the Earth's interior

#### **Codes** :

|     | (a) | ( <i>b</i> ) | (c) | (d) |  |
|-----|-----|--------------|-----|-----|--|
| (A) | (P) | (S)          | (R) | (Q) |  |
| (B) | (P) | (R)          | (S) | (T) |  |
| (C) | (P) | (T)          | (R) | (Q) |  |
| (D) | (S) | (Q)          | (P) | (R) |  |

- 56. Cyprus type Cu-Zn deposits are found in :
  - (A) Island arcs
  - (B) Passive continental margins
  - (C) Mid oceanic ridges
  - (D) Continental rifts
- 57. Choose the *correct* combination of ore and location of its deposit :
  - (A) Uranium Jaduguda
  - (B) Lead Khetri
  - (C) Gold Panna
  - (D) Iron Malanjkhand
- 58. Match the following :

## List I

- (1) Dissemination
- (2) Segregation
- (3) Residual liquid segregation
- (4) Residual liquid injection

## List II

- (i) Chromite deposit of Keonjhar (Odisha)
- (ii) Titaniferous magnetite deposit of Adivondaek region of New York
- (iii) Diamond deposit of Panna
- (*iv*) Titaniferous magnetite bands of Bushveld Complex

### **Codes** :

|     | (1)          | (2)          | (3)   | (4)          |
|-----|--------------|--------------|-------|--------------|
| (A) | (iii)        | ( <i>i</i> ) | (iv)  | (ii)         |
| (B) | (ii)         | (iii)        | (iv)  | ( <i>i</i> ) |
| (C) | ( <i>i</i> ) | (ii)         | (iii) | (iv)         |
| (D) | (iii)        | (i)          | (ii)  | (iv)         |

- 59. Analysis of coal that involves determination of weight percentage of carbon, sulfur, nitrogen and oxygen is called :
  - (A) Substrate
  - (B) Clariviate
  - (C) Ultimate
  - (D) Proximate
- 60. The Alpine-Himalayan orogenic belt characterizes the focal depths for :
  - (A) Deep Earthquakes (700 to 400 km)
  - (B) Shallow Earthquakes (< 100 km)</li>
  - (C) Intermediate Earthquakes(300-100 km)
  - (D) Shallow Earthquakes (< 5 km)

- 61. The major lithotectonic units in the Himalaya are bounded by thrust. Arrange correctly the thrust/fault system from north to south in this context.
  - (a) MCT
  - (b) Tethian Fault
  - (c) MBT
  - (d) HFT
  - (A) (b) (a) (c) (d)
  - (B) (a) (b) (c) (d)
  - (C) (d) (a) (b) (c)
  - (D) (c) (a) (b) (d)
- 62. Lithophile elements show affinity for :
  - (A) Sulphide phase
  - (B) Atmosphere
  - (C) Carbonate phase
  - (D) Silicate phase

#### JUN - 35220/II—D

- 63. At an archaeological site, human remain were found and assigned an age of 2000 years. One wants to confirm this with <sup>14</sup>C dating whose half-life is 5730 years. If the proportion of <sup>14</sup>C/<sup>12</sup>C in the remains is  $6 \times 10^{-13}$ , calculate their age (assume that the initial time the <sup>14</sup>C/<sup>12</sup>C ratio was  $1.2 \times 10^{-12}$ ).
  - (A) 2379 years
  - (B) 3379 years
  - (C) 4779 years
  - (D) 1379 years

64. Widmanstatten structure is associated with :

- (A) Tektites
- (B) Aerolites
- (C) Siderolites
- (D) Siderites

- 65. A chondrite normalised REE pattern of quartzo-feldspathic gneiss shows a sharp positive anomaly of Eu, which indicate presence of :
  - (A) Plagioclase in the sample
  - (B) Quartz in the sample
  - (C) Clinopyroxene in the sample
  - (D) Sillimanite in the sample
- 66. Global scale event at ~ 1.8 Ga and0.9 Ga refer to :
  - (A) Amalgamation of supercontinent Columbia and Rodinia
  - (B) Amalgamation of supercotinent Columbia and fragmentation of Rodinia
  - (C) Fragmentation of Supercontinent Columbia and Rodinia
  - (D) Fragmentation of supercontinent Columbia and amalgamation of Rodinia
- 67. Deep focus (~ 700 km) earthquakes are common in :
  - (A) Mid-oceanic ridge
  - (B) Island arc
  - (C) Himalayan mountain belt
  - (D) Continental rift

## JUN - 35220/II-D

- 68. A P-ray reflects from an interface as both P- and S-rays. Compared to the angle of reflection of the P-wave, that of the S-wave is :
  - (A) The same
  - (B) Always bigger
  - (C) Always smaller
  - (D) Sometimes bigger, sometimes smaller
- 69. Of the following electrical methods which methods make use of the electric fields naturally present in the earth ?
  - (i) SP method
  - (*ii*) Resistivity methods
  - (iii) Equipotential line method
  - (iv) Induced polarisation method
  - (v) Telluric current method
  - (vi) Electromagnetic methods
  - (A) (*i*), (*ii*), (*iii*)
  - (B) (i) and (v)
  - (C) (iii) and (iv)
  - (D) (iv) and (vi)

- 70. Calculate the free-air anomaly observed on a mountain of height 2000 m which is fully compensated by a root of depth t = 10 km. The compensation is by a cylinder of radius 20 km, the density of the crust is 2.67 g/cm<sup>3</sup>, and that of the mantle is 3.27 g/cm<sup>3</sup>.
  - $(A) \ 1932 \ gu$
  - (B) 2743 gu
  - (C) 3854 gu
  - (D) 4965 gu
- 71. For a series of point in a line and at zero height which are affected by gravitational attraction exerted by a buried sphere of density contrast 1.5 gm/cm<sup>3</sup>, the anomaly versus horizontal distance curve has a maximum of 4.526 MGal and a point of inflexion at 250 m from the maximum. Calculate the anomalous mass.
  - (A) 25.26 gu
  - (B) 45.26 gu
  - $(C) \ 52.43 \ gu$
  - (D) 60.10 gu
- 72. Which of the following relations between blocking temperature, Tb and Curie temperature Tc is correct ?
  - (A) Tb is always greater than Tc
  - (B) Tb is always less than Tc
  - $(C)\ \mbox{Tb}$  is equal to or less than  $\mbox{Tc}$
  - (D) Tb is equal to or greater than Tc

- 73. ..... is one of the allochemical constituent of carbonate rocks that is formed within the depositional basin by fragmentation of penecontemporaneous, weakly cemented carbonate sediment.
  - (A) Extraclast
  - (B) Peloid
  - (C) Bioclast
  - (D) Intraclast
- 74. The mean atmospheric pressure at sea level is given equivalently as :
  - (A) 1013 mb (hpa)
  - (B) 984 mb (hpa)
  - $(C) \ 1000 \ mb \ (hpa)$
  - (D) 950 mb (hpa)
- 75. Which of the following Eon characterizes the more tonalitic batholiths, more biomodal volcanic suites and the komatites ?
  - (A) Phanerozoic
  - (B) Proterozoic
  - (C) Archean
  - (D) Mesozoic
- 76. The strain velocity becomes zero in ...... and is constant under ......
  - (A) Elastic flow, Plastic flow
  - (B) Plastic flow, Elastic flow
  - (C) Elastic flow, Rheology
  - (D) Plastic flow, Creep

- 77. In diagenesis when transformation of mineral typically involve changes in crystal chemistry is termed as
  - (A) Neoformation
  - (B) Neomorphism
  - (C) Authigenesis
  - (D) Paragenetic sequence
- 78. In the Big Bang model of formation and evolution of universe, the temperatures of Universe evolved from :
  - (A)  $10^{83}\ \text{to}\ 10^5\ \text{K}$
  - (B) –100 K to  $10^{13}\ K$
  - $(C)\ 10^{15}$  to  $10^3\ K$
  - (D)  $10^{13}\ K$  to 3 K
- 79. The most important evidence that the universe is expanding is produced by :
  - (A) Supernova Explosion
  - (B) Black holes
  - $(C) \ \ Galactic \ \ collapse$
  - (D) Doppler effect
- 80. Example of primitive material that survived for the age of the solar system is :
  - (A) Carbonaceous chondrites
  - (B) Iron chondrites
  - (C) Magnesian Achondrites
  - (D) Olivine peridotite

- 81. The meteorites of igneous origin that are thought to have been dislodged by impact from small bodies in the solar system are known as :
  - (A) Enstatite
  - (B) Carbonaceous chondrites
  - (C) Achondrites
  - (D) Ignimbrites
- 82. The cause of equatorial bulge of the Earth is :
  - (A) Lunar gravitational attraction
  - (B) Plate tectonics
  - (C) Earth's anticlockwise rotation
  - (D) Centrifugal effect of the Earth's rotation
- 83. The secondmost abundant element in the bulk earth is :
  - (A) Oxygen
  - (B) Iron
  - (C) Magnesium
  - (D) Silicon

- 84. In Köppen climate system "BW" climate is called :
  - (A) Monsoon
  - (B) Wet-and-dry
  - (C) Steppe
  - (D) Desert
- 85. The most appropriate term for ecological succession beginning on a previously vegetated area that has been recently disturbed because of human activities is :
  - (A) Primary Succession
  - (B) Secondary Succession
  - (C) Tertiary Succession
  - (D) Bog Succession
- 86. Match the following :

## List I

- (a) Atoll formation
- (b) Gradualism
- (c) Glacial theory
- (d) Base level

## List II

( 1)

- (i) W.M. Davis
- (ii) Charles Darwin
- (iii) James Hutton
- (iv) J.L.R. Agassiz

## **Codes** :

|     | (a)        | (b)   | (c)   | (d)          |
|-----|------------|-------|-------|--------------|
| (A) | <i>(i)</i> | (iii) | (iv)  | (ii)         |
| (B) | (ii)       | (iii) | (iv)  | ( <i>i</i> ) |
| (C) | <i>(i)</i> | (ii)  | (iii) | (iv)         |
| (D) | (ii)       | (iv)  | (iii) | ( <i>i</i> ) |

 $\mathbf{17}$ 

#### JUN - 35220/II-D

- 87. One of the following parameters is *not* included in the calculation of Froude Number :
  - (A) Flow depth
  - (B) Average velocity of flow
  - (C) Channel cross-sectional area
  - (D) Acceleration due to gravity
- 88. The movement of soluble and finegrained material downward with descending water into sites of the soil B horizon.
  - (A) Illuviation
  - (B) Eluviation
  - (C) Induration
  - (D) Imbrication
- 89. The ground water system in which an aquifer is overlain and underlain by an aquifer represents which type of the following aquifer system ?
  - (A) Phreatic aquifer
  - (B) Perched aquifer
  - (C) Confined aquifer
  - (D) Semiconfined aquifer
- 90. Which one of the following is *not* a method of desalination ?
  - (A) Distillation
  - (B) Reverse Osmosis
  - (C) Electrodialysis
  - (D) Electrochlorosis

- 91. The belt overlying the water table in which water is drawn up from the zone of saturation and held against the force of gravity in all or some of the rock interstices is called
  - (A) Specific retention
  - (B) Static water level
  - (C) Capillary fringe
  - (D) Potentiometric surface
- 92. Coral bleaching is caused by :
  - (A) Excessive pollutains in sea water
  - (B) Excessive suspended sediments in sea water
  - (C) Excessively cool sea water temperature
  - (D) Excessively warm sea water temperature
- 93. Choose the *correct* answer regarding groin :
  - (A) It is beach ridge built naturally
  - (B) It is a wall built out into the sea at right angle to the shoreline
  - (C) It is a wall built in the sea parallel to the shoreline
  - (D) Sand accumulates on downdrift side of the groin
- 94. Choose the *correct* set of beaches on the west coast of India :
  - (A) Mandvi—Colva—Marina
  - (B) Varkala—Kovalam—Rishiknoda
  - (C) Digha—Colva—Ganpatipule
  - (D) Shrivardhan—Calangute— Gokarna

- 95. One of the following deltas is classified as a river-dominated delta :
  - (A) Mississippi
  - (B) Nile
  - (C) Mekong
  - (D) Ganga-Brahmaputra
- 96. Read the following statements and choose the *correct* answer :
  - Maximum ocean salinity values occur in the subtropics and minimum values near the equator and the polar regions.
  - (II) The maximum salinity levels in the subtropics are produced by a strong excess of precipitation over evaporation.
  - (A) Both (I) and (II) are correct
  - (B) (I) is correct but (II) is incorrect
  - (C) (I) is incorrect but (II) is correct
  - (D) Both (I) and (II) are incorrect
- 97. Read the following statements and identify the *correct* answer :
  - (I) The frequency plot of Earth's topography and bathymetry reveals that the distribution is bimodal.
  - (II) The cumulative curve of altitude and depth distribution is known as hypsographic curve.
  - (A) Both (I) and (II) are incorrect
  - (B) Both (I) and (II) are correct
  - (C) (I) is correct but (II) is incorrect
  - (D) (I) is incorrect but (II) is correct

- 98. Abrasion :
  - (A) It is a type of erosion by water, wind and glaciers
  - (B) It is absent in deserts where wind is the dominant agent of erosion
  - (C) It is absent in glaciated regions
  - (D) It is absent along the rocky coasts because of sea water salinity
- 99. The ratio of the combined stream lengths of a drainage basin to the basin area is defined as :
  - (A) Drainage density
  - (B) Stream frequency
  - (C) Bifurcation ratio
  - (D) Ruggedness number
- 100. True or False :
  - (I) Capillary forces are inversely proportional to the diameter of the conduits or pores transmitting the water.
  - (II) Capillary fringe is thicker in sandy soils or regolith than in clay grade soils.
  - (A) (I) is true, (II) is false
  - (B) (I) is false, (II) is true
  - $(C)\;\;Both\;\;(I)\;\;and\;\;(II)\;\;are\;\;true$
  - $(D) \ Both \ (I) \ and \ (II) \ are \ false$

JUN - 35220/II—D

**ROUGH WORK**