	प्रश्तपत्रि Pap	oklet Code & Serial No. का कोड व क्रमांक <b>er-II</b>			B	В					
EARTH, ATMOSPHERIC, OCEAN AND PLANETARY SCIENCE											
Sigr	nature and Name of Invigilator	S	Seat No.								
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SE	P - 35221			(To l	be filled	l by t	he C	andio	date)		
Tim	e Allowed : 2 Hours]				[Maxir	num	n Ma	rks :	200		
Nun	ber of Pages in this Booklet : 16	Nu	mber of	Quest	ions in	this	Bool	klet :	100		
<ol> <li>1.</li> <li>2.</li> <li>3.</li> <li>4.</li> </ol>	<ul> <li>Instructions for the Candidates</li> <li>Write your Seat No. and OMR Sheet No. in the space provided on the top of this page.</li> <li>This paper consists of 100 objective type questions. Each question will carry <i>two</i> marks. <i>All</i> 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 : <ul> <li>(i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet with but sticker-seal or open booklet.</li> <li>(ii) 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 will be replaced nor any extra time will be given. The same may please be noted.</li> </ul> </li> <li>(iii) After this verification is over, the OMR Sheet Number should be entered on this Test Booklet.</li> <li>(iii) Cand (D). You have to darken the circle as indicated below on the correct response against each item.</li> <li>Example : where (C) is the correct response.</li> </ul>	1. 2. 3.	परिक्षार्थींनी 3 तसेच आपणां सदर प्रश्नपरि आहेत. या प्रग्न परीक्षा सुरू झ मिनीटांमध्ये 3 पहाव्यात. (i) प्रश्- सील (ii) पहि (iii) पहि तसे पुष्टे अस 5 मि घ्यार वाढ (iii) वरी अो. प्रत्येक प्रश्ना आहेत. त्यार्ती काळा/निळा व <b>उदा. :</b> जर ((	विद्यार्थ्यार गापला आसन् स दिलेल्या इ क्रकेत 100 रनपत्रिकेतीत गल्या पुष्ठाव पत्रिका उध न सलेली किं ल्या पृष्ठाव त प्रश्नपत्रिक लेली किंवा व प्रश्नपत्रिक लेली किंवा व प्रश्नपत्रिक लेपी किंवा व प्रश्नपत्रिक लेपी किंवा रात्रिमाणे स एम.आर. उक्त पाठी (A), (I ल योग्य उ करावा.	साठी महत्त्वा न क्रमांक या प उत्तरपत्रिकेचा बहुपर्यायी प्रश् त <b>सर्व</b> प्रश्न प द्रार्थ्याला प्रश्न प्रश्नपत्रिका उ र नमूद केल्त केतील एकूण तेली/कमी प्र इत्तर जुटी अस प्रश्नपत्रिका न तरपत्रिकेचा न 3), (C) आणि तराचा रकान उत्तर असेल त	व्या सूच जुष्ठावरीत क्रमांक रन आहेत पत्रिका पत्रिका पत्रिका पत्रिका पत्रिका पत्रिका पत्रिका स्वरलून क्रपया वि न पाहि करपया वि त (D) अप र.	ना ल वरच्या त्याखार्ल , प्रत्येक अनिवार दिली जाः ालील बा ज्वर लावर प्रश्नपत्रि प्रश्नपति प्रश्नपति प्रश्नि संख्या त्यानंतर ावा. शी चार f दर्शविल्ल	कोप-यात ो लिहावा प्रश्नास में आहे. ईल. सुरुव बी अवश लेले सील सकेची एर पडताळू नांचा चुव प्रिका सु श्रनपत्रिक नाही तसे नोंद घ्या च प्रश्न वकलप उ वकलप उ याप्रमाणे	त लिहावा. दोन गुण वातीच्या 5 य तपासून य तपासून व उघडावे. करूण पृष्ठे त पहावी. ज मागवून च वेळही वी. पत्रिकेवर अत्तरे दिली ठळकपणे		
5. 6. 7. 8.	Your responses to the items are to be indicated in the <b>OMR</b> <b>Sheet given inside the Booklet only.</b> 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	5. 6. 7. 8.	या प्रश्नपत्रिके इतर ठिकाणी f आत दिलेल्या प्रश्नपत्रिकेच्ट जर आपण अं नाव, आसन चेन्द्रेनी अपन	(A) जील प्रश्नांच लहिलेली उत्त सूचना काठ ग शेवटी जो 1. एम. आर क्रमांक, फोन न अप्रच्याप	B ती उत्तरे ओ.ए रे तपासली जा ठजीपूर्वक वाः डलेल्या कोन्य वर नमूद केल न नंबर किंवा	म.आर. णार नाही वाव्यातः पा पानाव तेल्या ठिव ओळख	<b>b</b> उत्तरपत्रि त. रच कच्चे काणा व्या पटेल अ	केतच दः वे काम क तिरीक्त इत शी कोणत	र्शवावीत. रावे. तर कोठेही तीही खूण		
<ol> <li>9.</li> <li>10.</li> <li>11.</li> <li>12.</li> </ol>	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.	9. 10. 11. 12.	अवलंब केल्यास विद्यार्थ्याला परीक्षेस अपात्र ठरविण्यात येईल. परीक्षा संपल्यानंतर विद्यार्थ्यांना 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.								

SEP - 35221/II—B

# 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.

- 1. Identify the *correct* sequence of mass movements on the basis of increasing rate of movement :
  - (A) Solifluction-creep-rock fall-debris flow
  - (B) Solifluction-debris flow-rock fall-earth flow
  - (C) Creep-rotational landslidedebris flow-rock fall
  - (D) Creep-rotational landslide-rock fall-solifluction
- 2. A river will develop braided channel pattern due to significant :
  - (A) Increase in the amount of coarse sediment load
  - (B) Decrease in the amount of coarse sediment load
  - (C) Increase in channel sinuosity
  - (D) Decrease in wash load
- 3. Which one of the following is *not* one of the chemical weathering processes ?
  - (A) Hydrolysis
  - (B) Oxidation
  - (C) Ice crystal growth
  - (D) Carbonic acid reaction

- 4. Soil profiles preserved over long periods of time but which are not being actively developed today are known as :
  - (A) Palaeosols (B) Lignite beds
  - (C) Solum (D) Histosols
  - 5. True or False :
    - I. If a fault displaces the surface of the ground so that one side is higher or lower than the other, a monoclinal scarp results.
    - **II.** Tectonic scarps with height, steepners and lateral continuity comparable to fault scarp are formed by steep monoclines.
    - (A) I is True and II is false
    - (B) I is False and II is True
    - (C) Both I and II are True
    - (D) Both I and II are False
  - 6. ..... is the level in the ocean where rate of dissolution of carbonate balances the rate of accumulation.
    - (A) Transition layer
    - (B) Calcite compensation depth
    - (C) Carbonate critical depth
    - (D) Lysocline

- 7. The group of coal macerals derived from plant secretions is known as :
  - (A) Inertinite (B) Leptynite
  - (C) Vitrinite (D) Secrinite
- 8. Diamonds are explored in :
  - (A) Kimberlites and Lamproites
  - (B) Komatiites
  - (C) Spilites
  - (D) Anorthosites
- 9. Banded iron formations in the Archaean greenstone belts are best witness for :
  - (A) Archaean sedimentary basin development
  - (B) Shift from anoxic to oxygenated environments
  - (C) Archaean cratons
  - (D) Archaean weathering process
- 10. Which one of the following is an ore of platinum group of elements (PGE)?
  - (A) Sperrylite (B) Digenite
  - (C) Diopside (D) Bornite
- 11. 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

- 12. Arrange *correctly* the following continental assembly according to ages :
  - (a) Ur (b) Nena (c) Rodina (c) Rodina (c) (a) - 1, (b) - 2, (c) - 3(c) (a) - 3, (b) - 2, (c) - 1
  - (C) (a) 2, (b) 1, (c) 3
  - (D) (a) 1, (b) 3, (c) 2
- 13. The Palghat-Cauvery shear zone comprises :
  - (A) Charnokite interbanded with khondalites
  - (B) TTG with dolerites
  - (C) Greenstone belts
  - (D) Khondalites interbanded with Anorthosites
- 14. 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
- 15. 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

- 16. 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
- 17. In spherical coordinates, with spherical geometry, the rate of decrease of pressure (p) with radius (r)is given by, (g = acceleration due togravity;  $\rho = \text{density})$ :

(A) 
$$\frac{dp}{dr} = \rho + g$$
 (B)  $\frac{dp}{dr} = \sqrt{\rho g}$   
(C)  $\frac{dp}{dr} = -\rho g$  (D)  $\frac{dp}{dr} = \rho g^2$ 

- 18. 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
- 19. The Neotethys ocean opened during Early Permian as a result of rifting of ...... with Indian continent.
  - (A) Variscan Terranes
  - (B) Hindukush Terranes
  - (C) Cimmerian Terranes
  - (D) Russian Continent

- 20. Match the following structural trends with their regional orientation :
  - (a) Dharwar (1) ENE WSW Trend
  - (b) Satpura (2) NW SE Trend
  - (c) Aravali (3) NE SW Trend
  - (A) (a) 2, (b) 1, (c) 3
  - (B) (a) 1, (b) 2, (c) 3
  - (C) (a) 2, (b) 1, (c) 2
  - (D) (a) 3, (b) 2, (c) 1
- 21. Which one of the following methods is best suited for dating highly deformed and metamorphosed Archaean gneissic rocks containing multiple age components ?
  - (A) Whole rock U-Pb dating
  - (B) Single zircon dating
  - (C) Whole rock Pb-Pb dating
  - (D) Carbon dating
- 22. Which one of the following lunar materials shows positive europium anomaly ?
  - (A) KREEP
  - (B) Anorthosite
  - (C) Apollo 11 Hi-K Basalt
  - (D) Apollo 11 Quartz Tholeiite

- 23. Amongst the following, which mineral phase has highest condensation temperature ?
  - (A) Enstatite (B) Magnetite
  - (C) Corundum (D) Anorthite
- 24. Which one of the following rocks generates the maximum amount of heat by radioactive decay ?
  - (A) Chondritic meteorite
  - (B) Peridotite
  - (C) Granite
  - (D) Dolerite
- 25. Along which one of the following boundaries there is no change in chemical composition ?
  - (A) Upper mantle and lower mantle
  - (B) Crust and mantle
  - (C) Core and mantle
  - (D) Oceanic plate and lower horizon
- 26. In the deep ocean the circulation is caused by density variations due to difference in :
  - (A) Temperature and water depth
  - (B) Temperature and salinity
  - (C) Water depth and salinity
  - (D) Sea surface temperature and air temperature

27. Match the following :

- (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

#### Π

- (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*)
- 28. 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

- 29. 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
- 30. Match the following :

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- (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

## Π

- (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*)
- 31. 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

- 32. Which one of the following compositions correctly represents for sterite ?
  (A) (MgFe)<sub>2</sub> SiO<sub>3</sub>
  - (B)  $MgSiO_4^2$
  - (C)  $FeSiO_4$
  - (D)  $(MgFe)^{T} SiO_4$
- 33. Which one of the following minerals exhibits negative magnetic susceptibility ?
  (A) Pyroxene (B) Quartz
  - (C) Olivine (D) Biotite
- 34. Match the following :

#### Ι

- (1) Carlsbad twin
- (2) Beveno twin
- (3) Manebach twin
- (4) Swallo-tails

(i)

## Π

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 *iii*, 4 *iv*(C) 1 *iv*, 2 *i*, 3 *iii*, 4 *ii*(D) 1 *i*, 2 *iii*, 3 *iv*, 4 *ii*35. Dravite is a :

  (A) Ca-pyroxene
  (B) Mg-tourmaline
  (C) fe-tourmaline
  (D) Mg-augite

  36. 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

- 37. 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
- 38. 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° from a focus on the surface. Calculate the interval between the arrival time of the directed 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
- 39. 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)  $\tan I = \tan 2\lambda$

## 40. The magnetic field at the equator, compared to that at the pole is : (A) 4 times

- (B) Twice
- (C) The same (D) Half

- 41. Which of the following ways of measuring the size of an earthquake does not need an instrumental record?
  - (A) Richter Magnitude
  - (B) Mw
  - (C) Moment
  - (D) Intensity
- 42. If an earthquake 'A' has a Richter magnitude of 7 and 'B' that of 6. Then :
  - (A) A is '10' times more intense than
  - (B) A is '28' times intense than B
  - (C) A is '5' times intense than B
  - (D) A is 1000 times intense than B
- 43. A seismic 'P' wave making a complete traverse from crust, mantle, core and back to crust is denoted as: (A) PMCMP
  - (B) PKIKP
- $\begin{array}{cccc} (C) & P_m & P_c & P_{Ic} & P_m & P_c \\ (D) & P_n & I_n & P_n & P_s \\ The orbital radius of a planet sweeps \end{array}$ 44. out equal areas in equal intervals of time is stated by :
  - (A) Newton's law
  - (B) Bode's law
  - (C) Kepler's law
  - (D) Doppler effect
- The value for average density of the 45. earth is derived from measurement of :
  - (A) Acceleration due to gravity
  - (B) Density of rocks of earth composition
  - (C) Planetary accretion
  - (D) Matter inside the earth
- 46. The topography and gravity field of Mars indicate that its crust is : (A) Out of hydrostatic equilibrium
  - (B) In hydrostatic equilibrium
  - (C) Of uniform thickness
  - (D) Uniformly thin

- 47. Most sensitive instrument for magnetic survey is :
  - (A) Optically pumped magnetometer
  - (B) Proton precession magnetometer
  - (C) Magnetic field balance
  - (D) Fluxgate magnetometer
- 48. With which type of wave the phenomenon of compression and rare faction is associated ?
  - (A) P-waves (B) S-waves
  - (C) Core waves (D) K-waves
- 49. Match the following Resistivity curve types :

Ι

- (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)
- 50. 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) Schlamberger configuration
  - (D) Orellana-money configuration

- 51. Speed of the P-waves is the highest among which of the following rocks/ phases ?
  - (A) Water (B) Shale
  - (C) Basalt (D) Peridotite
- 52. 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

53. Identify the *correct* statements from the following :

The storage coefficient of an aquifer is :

- (a) Attributable to compressibility of the aquifer skeleton and the pore water
- (b) Attributable to the compressibility of the aquifer skeleton and expansibity of the pore water
- (c) Attributable to the expansibility of the aquifer skeleton and the pore water
- (d) 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
- (A) (b) and (a)
- (B) (a) and (c)
- (C) (a) and (d)
- (D) (b) and (d)
- 54. The ratio of transmissivity to the coefficient of storativity of an aquifer is defined by the term ......
  - (A) Hydraulic conductivity
  - (B) Hydraulic gradient
  - (C) Hydraulic viscosity
  - (D) Hydraulic diffusivity
- 55. Which of the following is associated with Kaladgi Basin ?
  - (A) Badami Group
  - (B) Indravati Group
  - (C) Chitravati Group
  - (D) Semri Group

- 56. The highly folded and partly denuded ancient mica-schists, phyllites and slates of Kumaon-Garhwal Himalayas named as :
  - (A) Haimanta system
  - (B) Vaikrita system
  - (C) Jutogh series
  - (D) Salkhalas
- 57. Which of the following sequences is the correct order of appearance in the geological history of Earth :
  - (A) Fishes-Flowering plants-Whales-Dinosaurs
  - (B) Flowering plants-Fishes-Whales-Dinosaurs
  - (C) Fishes-Dinosaurs-Flowering plants-Whales
  - (D) Fishes-Dinosaurs-Whales-Flowering plants
- 58. Match the following textures with their characterstic crystal size :

### Texture

- (a) Glassy
- (b) Aphanitic
- (c) Phaneritic
- (d) Cumulate
- Characteristic Crystal size
- (i) Fine grained rocks
- (ii) Coarse grained rocks
- (*iii*) Early crystalizing mineral from a matrix of interlocking euhedral grains
- (*iv*) Rapidly cooling with no crystal **Codes :**
- (A) (a) (ii), (b) (i), (c) (iv), (d) (iii)
- (B) (a) (i), (b) (iv), (c) (ii), (d) (iii)
- (C) (a) (iii), (b) (iii), (c) (ii), (d) (ii)
- (D) (a) (iv), (b) (i), (c) (ii), (d) (iii)

- 59. 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
- 60. At the highest pressure of bluleschist facies, a jadeite pyroxene may form from albite making the beginning of the transition to ...... facies.
  (A) Comparability (B) Appril bality
  - (A) Greenschist (B) Amphibolite
  - (C) Eclogite (D) Granulite
- 61. 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
- 62. The extrusive igneous rock that contains calcium-rich plagioclase, feldspathoid, olivine and pyroxene are termed as :
  - (A) Nephelinite (B) Basanite
  - (C) Coppaelite (D) Basalt
- 63. Mylonite in which grain growth has occurred either during or after the deformation, such mylonite are termed as ......
  - (A) Blastomylonite
  - (B) Blastophitic
  - (C) Diaxtexite
  - (D) Granoblastic

64. Although minor constituents of the average mantle, presence of these oxides change the mineralogy of mantle :

(A)  $Al_2O_3$ , CaO and  $Na_2O$ (B)  $K_2O$ ,  $P_2O_5$  and CaO

(C)  $\mbox{Pb}_3\mbox{O}_4,\ \mbox{Fe}_2\mbox{O}_3$  and  $\mbox{TiO}_2$ 

- (D) Al(OH),  $\mathrm{H_2O}$  and  $\mathrm{Na_2O_3}$
- 65. 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 + Calcplagioclase
- (*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) 
$$(a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)$$

- 66. 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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- 67. The total electrical resistance for a unit area of the Atmospheric column from the earth surface to the ionosphere is called :
  - (A) Columnar resistance
  - (B) Columnar potential
  - (C) Columnar field
  - (D) Columnar conductivity
- 68. Ice-particles only ..... microwave radiation.
  - (A) deflect (B) adsorb
  - (C) absorb (D) scatter
- 69. Marshall and Palmer (1948) have suggested a relation to determine the droplet size distribution from the :
  - (A) Liquid water path
  - (B) Liquid water content
  - (C) Rainfall rate
  - (D) Cloud thickness
- 70. The triple point for water is ...... at a pressure of 6.11 hPa (mb).
  - (A) 303°K (B) 273°K
  - (C) 293°K (D) 283°K
- 71. According to Dvorak classificationT3.5 represents :
  - (A) Tropical Depression
  - (B) Tropical Cyclone
  - (C) Cat 1 Hurricane
  - (D) Cat 2 Hurricane

- 72. Which group of the following are referred as high clouds ?
  - (A) Stratus, Stratocumulus, Nimbostratus
  - (B) Cirrus, Cirrostratus, Cirrocumulus
  - (C) Altostratus, Altocumulus
  - (D) Cumulus, Cumulonimbus
- 73. Steam fog and frontal fog, form as the :
  - (A) Water evaporates and mixes with drier air
  - (B) Air cools and mixes with drier air
  - (C) Air warms and mixes with drier air
  - (D) Air circulate and mixes with drier air
- 74. Convection represents the vertical movement of :
  - (A) Warmer air upward and cooler air downward
  - (B) Cooler air upward and warmer air downward
  - (C) Warmer air downward
  - (D) Cooler air upward
- 75. The merging of cloud droplets by collision is called :
  - (A) Nucleation (B) Condensation
  - (C) Coalescence (D) Collision

- 76. 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.
  (A) 1 : 1000 (B) 1 : 1,00,000 (C) 1 : 10 (D) 1 : 500
- 77. When ice cystals 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
- 78. 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
- 79. Which of the following is *not* Dispersive wave ?
  - (A) Russby wave
  - (B) Deep water gravity wave
  - (C) Shallow water gravity wave
  - (D) Inertia wave

- 80. 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
- 81. 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

- 82. Which of the following microfossils is commonly used in biostratigraphic correlation of Palaeozoic marine strata ?
  (A) An giagger Paller
  - (A) Angiosperm Pollen
  - (B) Diatoms
  - (C) Chitinozoans
  - (D) Dinoflagellates

83. 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) <b>17.30%</b>
(C)	27.30%	(D) 25.00%

- 84. 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
- 85. In Köppen climate system "BS" climate is called :
  - (A) Desert (B) Steppe
  - (C) Wet-and-dry (D) Monsoon
- 86. One of the following is *not* one of the major biomes :
  - (A) Desert (B) Tundra
  - (C) Forest (D) Woodland
- 87. 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** :

- 88. 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
- 89. 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.
- 90. 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
- 91. 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

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92. ..... 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
- 93. One of the following mountains is not in Europe :
  - (A) Pyrenees (B) Alps
  - (C) Atlas (D) Carpathians
- 94. Podzolization is common in :
  - (A) Warm and humid climates
  - (B) Cool and moist climates
  - (C) Warm and dry climates
  - (D) Cool and dry climates
- 95. One of the following is *not* a karst feature :
  - (A) Doline (B) Kettle hole
  - (C) Sink hole (D) Uvala
- 96. The fan-shaped system of distributive and anastomosing channels developed on the side of a natural levee :
  - (A) Debris Cone
  - (B) Crevasse-splay
  - (C) Fan delta
  - (D) Meanderscroll

- 97. In one of the following types of mass movements, the movement is essentially vertical and downward and there is little or no horizontal component :
  - (A) Landslide (B) Creep
  - (C) Subsidence (D) Mudflow
- 98. In Dunham's (1962) classification of limestone ...... represents limestone containing more than 10% grains in carbonate mud.
  (A) Wackestone (B) Packstone
  (C) Mudstone (D) Boundstone
- 99. ..... is a type of cross bedding which is characterised by oppositely dipping directions of foreset laminae in adjacent sediment layers.
  - (A) Lenticular bedding
  - (B) Flaser bedding
  - (C) Herringbone cross bedding
  - (D) Hummocky cross bedding
- 100. Mark the *correct* statement regarding deposition of pyrite :
  - (A) It is deposited in a reducing environment
  - (B) It is deposited under both acid and alkaline conditions
  - (C) It is deposited in oxidising environment under both acid and alkaline conditions
  - (D) It is deposited in a reducing environment under both acid and alkaline conditions

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**ROUGH WORK**