



EARTH SCIENCES

Name & Signature of the Invigilator

PAPER – II

OMR Answer Sheet No. :

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DEC-21/20

Roll No. :

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(in figures as in Hall Ticket)

Roll Number in words :

200098

Question Booklet Sl. No.

Time : 2 Hours]

No. of Printed Pages : 20

[Maximum Marks : 200

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page.
2. This paper consists of **one hundred (100)** multiple choice type of questions. **All** questions are compulsory.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
 - (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 without sticker seal and do not accept an open booklet.
 - (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 pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.
 - (iii) After this verification is over, the Test Booklet Number should be entered on the OMR Answer Sheet and the OMR Answer Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the oval as indicated below on the correct response against each item.
Example : (A) (B) (C) (D) where (B) is the correct response.
5. Your responses to the items are to be indicated on the OMR Answer Sheet under Paper – II only. If you mark your response at any place other than in the oval in the OMR Answer Sheet, it will not be evaluated.
6. Rough Work is to be done in the end of this booklet.
7. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Answer 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, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
8. You have to return the original OMR Answer 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 original question booklet and duplicate copy of OMR Answer Sheet on conclusion of examination.
9. Use only Blue/Black Ball point pen.
10. Use of any calculator or any electronic devices or log table etc., are prohibited.
11. There shall be no negative marking.

પરીક્ષાર્થીઓ માટે સૂચનાઓ

1. આ પાનાની ટોચ પર દર્શાવેલી જગ્યામાં તમારો રોલ નંબર લખો.
2. આ પ્રશ્નપત્રમાં બહુવિકલ્પિક ઉત્તરો ધરાવતા સૌ (૧૦૦) પ્રશ્નો આપેલા છે. બધા જ પ્રશ્નો ફરજિયાત છે.
3. પરીક્ષાની શરૂઆતમાં આપને પ્રશ્નપુસ્તિકા આપવામાં આવશે. પ્રથમ પાંચ (૫) મિનિટ દરમિયાન તમારે પ્રશ્નપુસ્તિકા ખોલી અને ફરજિયાતપણે નીચે મુજબ પરીક્ષણ કરવું :
 - (i) પ્રશ્નપુસ્તિકાનો વપરાશ કરવા માટે આ કવર પૃષ્ઠની ધાર પર આપેલ સીલ સ્ટીકર ફાડી નાખો. કોઈપણ સંજોગોમાં સીલ સ્ટીકર વગરની કે ખુલ્લી પ્રશ્નપુસ્તિકા સ્વીકારશો નહીં.
 - (ii) કવર પૃષ્ઠ પર છપાયેલ નિર્દેશાનુસાર પ્રશ્નપુસ્તિકાના પ્રશ્નો, પૃષ્ઠો અને સંખ્યાને બરાબર ચકાસી લો. ખામીયુક્ત પ્રશ્નપુસ્તિકા કે જેમાં પ્રશ્નો/ પૃષ્ઠો ઓછાં હોય, બે વાર છપાયા હોય, અનુક્રમમાં અથવા અન્ય કોઈ ફરક હોય અર્થાત કોઈપણ સંજોગોમાં ખામીયુક્ત પ્રશ્નપુસ્તિકા સ્વીકારશો નહીં. અને જો ખામીયુક્ત પ્રશ્નપુસ્તિકા મળી હોય તો નિરીક્ષક પાસેથી તુરંત જ બીજી સારી પ્રશ્નપુસ્તિકા મેળવી લેવી. આ માટે ઉમેદવારને પાંચ (૫) મિનિટનો સમયગાળો આપવામાં આવશે. પછીથી, પ્રશ્નપુસ્તિકા બદલવામાં આવશે નહીં કે કોઈ વધારાનો સમયગાળો આપવામાં આવશે નહીં.
 - (iii) આ ચકાસણી સમાપ્ત થાય પછી, પ્રશ્નપુસ્તિકાનો નંબર OMR જવાબ પત્રક પર લખવો અને OMR જવાબ પત્રકનો નંબર પ્રશ્નપુસ્તિકા પર લખવો.
4. પ્રત્યેક પ્રશ્ન માટે ચાર જવાબ વિકલ્પ (A), (B), (C) અને (D) આપવામાં આવેલ છે. તમારે સાચા જવાબના ઓવલ (oval) ને નીચે આપેલ ઉદાહરણ મુજબ પેનથી ભરીને સંપૂર્ણ કાળું કરવાનું રહેશે.
ઉદાહરણ : (A) (B) (C) (D) કે જ્યાં (B) સાચો જવાબ છે.
5. આ પ્રશ્નપુસ્તિકાના પ્રશ્નોના જવાબ અલગથી આપવામાં આવેલ OMR જવાબ પત્રકમાં પેપર-II લખેલ વિભાગમાં જ અંકિત કરવા. જો આપ OMR જવાબ પત્રકમાં આપેલ ઓવલ (oval) સિવાય અન્ય સ્થાને જવાબ અંકિત કરશો તો તે જવાબનું મૂલ્યાંકન કરવામાં આવશે નહીં.
6. કાચું કામ (Rough Work) પ્રશ્નપુસ્તિકાના અંતિમ પૃષ્ઠ પર કરવું.
7. જો આપ OMR જવાબ પત્રક નિયત જગ્યા સિવાય અન્ય કોઈપણ સ્થાને, આપનું નામ, રોલ નંબર, ફોન નંબર અથવા એવું કોઈ ચિહ્નકે જેનાથી તમારી ઓળખ થઈ શકે, અંકિત કરશો અથવા અલદ્ર ભાષાનો પ્રયોગ કરો, અથવા અન્ય કોઈ અનુચિત સાધનોનો ઉપયોગ કરો, જેમકે અંકિત કરી દીધેલ જવાબ ભૂંસી નાખવો કે સફેદ શાહીનો ઉપયોગ કરી બદલશો તો આપને પરીક્ષા માટે અયોગ્ય જાહેર થઈ શકો છો.
8. પરીક્ષા સમય પૂરો થઈ ગયા બાદ ઓરીજનલ OMR જવાબ પત્રક જે તે નિરીક્ષકને ફરજિયાત સોંપી દેવું અને કોઈ પણ સંજોગોમાં તે પરીક્ષા ખંડની બહાર લઈ જવું નહીં. પરીક્ષા પૂર્ણ થયા બાદ ઉમેદવાર ઓરીજનલ પ્રશ્નપુસ્તિકા અને OMR જવાબ પત્રકની ડુપ્લિકેટ કોપી પોતાની સાથે લઈ જઈ શકે છે.
9. માત્ર કાળી / ભૂરી બોલ પોઈન્ટ પેન વાપરવી.
10. કેલ્ક્યુલેટર, લોગ ટેબલ અને અન્ય ઇલેક્ટ્રોનિક યંત્રોનો ઉપયોગ કરવાની મનાઈ છે.
11. ખોટા જવાબ માટે નકારાત્મક ગુણાંકન પ્રથા નથી.

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EARTH SCIENCES
Paper – II

1. The ultra high density zones in the universe capable of bending electro-magnetic waves are indicative of the presence of _____
 - (A) Black holes
 - (B) Neutron stars
 - (C) Quasars
 - (D) Galactic waves

2. Stratigraphy based on fossil records is known as _____
 - (A) Lithostratigraphy
 - (B) Biostratigraphy
 - (C) Chronostratigraphy
 - (D) Relative stratigraphy

3. Which one of the following SiO_2 polymorphs may form because of meteorite impact ?
 - (A) Quartz
 - (B) Tridymite
 - (C) Opal
 - (D) Stishovite

4. Decay constant (λ) and half life ($T_{1/2}$) are related by mathematical relationship as
 - (A) $T_{1/2} = \frac{0.693}{\lambda}$
 - (B) $T_{1/2} = 0.693 \times \lambda$
 - (C) $T_{1/2} = 0.693 + \lambda$
 - (D) $\lambda = 0.693 \times T_{1/2}$

5. Identify Kepler's second law.
 - (A) "The radius vector drawn from the Sun to the planet sweeps out equal areas in equal interval of time".
 - (B) All the planets revolve around the sun in elliptical orbits having sun at one of the foci
 - (C) Sun revolves around planet in elliptical orbit
 - (D) The square of the time period of revolution of a planet around the sun in an elliptical orbit is directly proportional to the cube of its semi-major axis



6. The most abundant element in the earth's lithosphere is _____
- (A) Si (B) O
(C) Al (D) Fe
7. Goldich's relative weathering potential from high to low for rock forming minerals is _____
- (A) Orthoclase – Muscovite – Quartz – Biotite – Olivine – Amphibole – Pyroxene
(B) Olivine – Pyroxene – Amphibole – Biotite – Orthoclase – Muscovite – Quartz
(C) Pyroxene – Amphibole – Biotite – Olivine – Orthoclase – Muscovite – Quartz
(D) Muscovite – Orthoclase – Quartz – Olivine – Pyroxene – Amphibole – Biotite
8. _____ clay mineral dominates in oceanic sediment.
- (A) Illite (B) Montmorillonite
(C) Kaolinite (D) Bentonite
9. The mechanism that transports small pebbles and sands by bouncing along the river bed is called as _____
- (A) Traction (B) Saltation
(C) Suspension (D) Bed load
10. _____ seismic waves are recorded as first arrival in a seismogram after a seismic event.
- (A) L (B) S
(C) P (D) R
11. The lower mantle and outer core are separated by _____ discontinuity.
- (A) Mohorovicic (B) Guttenberg
(C) Conrad (D) Repetti
12. Andean-Type mountain belts forms in _____
- (A) Island arc
(B) Continental arc
(C) Continental-continental collision
(D) Continental-rift zone



13. Which of the following is not a craton ?
- (A) Dharwar (B) Bastar
(C) Southern granulite terrane (D) Singhbhum
14. The principle of original horizontality states that _____
- (A) Layers of sediments are deposited horizontally
(B) Horizontal layers are of sedimentary origin
(C) Younger strata are deposited on older strata
(D) Beds extends laterally until they thin to zero thickness
15. The portion of continental margin that marks the true edge of continent is _____
- (A) Continental shelf
(B) Continental slope
(C) Continental rise
(D) Abbysal plains
16. The benthic organisms living at the deep ocean floor gets oxygen due to _____
- (A) Weathering of oxide minerals at sea floor
(B) Submarine volcanic eruptions
(C) Sinking of polar water to sea floor
(D) Decay of organic matter at sea floor
17. The average atomic mass computed based on the abundances of ^{85}Rb and ^{87}Rb ; taken as 72.17% and 27.83% and their respective atomic weights as 84.912 and 86.909 is _____
- (A) 85.000 (B) 85.398
(C) 85.855 (D) 85.960
18. The condition for formation of sabkha environment is _____
- (A) arid and semi arid above high tide
(B) humid above high tide
(C) humid along the coast
(D) semi arid below the tide level



19. What is the typical mineralogy of eclogite ?
- (A) Pyrope, Omphacite, Rutile, Kyanite
 - (B) Grossularite, Diopside, Rutile, Quartz
 - (C) Plagioclase, Pyrope, Forsterite, Spinal
 - (D) Andradite, Fayalite, Kyanite, Quartz
20. Which of the following pairs satisfy the condition I, II, III ?
- I. Skeleton made up of polymorphs of CaCO_3
 - II. Found in Palaeozoic Benthic ecosystem
 - III. Morphological planes of symmetry
- (A) Radiolarians and Diatoms
 - (B) Bivalves and Brachiopoda
 - (C) Foraminifers and Ostracoda
 - (D) Gastropods and Bivalves
21. Plagioclase composition of anorthosite as compared to granodiorite is _____
- (A) More or less similar
 - (B) More potassic
 - (C) More calcic
 - (D) More sodic
22. Khondalite rocks are characteristically found in _____
- (A) Eclogite facies
 - (B) Granulite facies
 - (C) Amphibole facies
 - (D) Green-schist facies
23. The reason for Basalt and Rhyolite being fine grained than Gabbro and Granite is _____
- (A) Basalts and Rhyolites are formed at higher temperature and pressure
 - (B) Gabbro and Granites are formed at low temperature and pressure
 - (C) Basalts and Rhyolites formed from rapid cooling of lava
 - (D) Basalts and Rhyolites are formed from slow cooling of lava
24. Nepheline Syntite is fractionated from _____ melt.
- (A) Calc-alkaline
 - (B) Alkaline
 - (C) Alkali-calc
 - (D) Calc



25. Ophiolitic mélangé is characteristic of _____
- (A) Higher Himalaya
 - (B) Lesser Himalaya
 - (C) Indus Suture Zone
 - (D) Outer Himalaya
26. Which system shows peritectic reaction ?
- (A) Forsterite – Silica
 - (B) Forsterite – Olivine
 - (C) Albite – Anorthite
 - (D) Diopside – Anorthite
27. In the following set of facies, choose the one which represents increasing pressure and relatively low temperatures.
- (A) Zeolite – Green schist – Blue schist
 - (B) Blue schist – Green schist – Zeolite
 - (C) Zeolite – Green schist – Granulite
 - (D) Green schist – Zeolite – Blue schist
28. At the binary eutectic, which of the following phases coexist ?
- (A) No crystal phases, only a liquid
 - (B) A crystal phase and a liquid
 - (C) Two crystal phases and a liquid
 - (D) Three crystal phases and a liquid
29. The case of Barrovian metamorphism the lowest grade of metamorphism is marked by the mineral
- (A) Garnet
 - (B) Biotite
 - (C) Chlorite
 - (D) Kyanite
30. The reaction garnet + chlorite \leftrightarrow staurolite + biotite is an example of _____
- (A) Net transfer reaction
 - (B) Devolatilization reaction
 - (C) Ion exchange reaction
 - (D) Oxidation reaction



31. Paired metamorphic belt is characteristic of _____
- (A) Continental rift zone
 - (B) Sea-floor spreading zone
 - (C) Continental collision zone
 - (D) Subduction zone
32. Compressibility is the reciprocal of _____
- (A) Bulk modulus
 - (B) Young's modulus
 - (C) Rigidity modulus
 - (D) Hooke's modulus
33. On a Survey of India toposheet (1 : 50,000) a distance of 4 cm between two points represents an actual distance of _____
- (A) 2 km
 - (B) 8 km
 - (C) 1 km
 - (D) 16 km
34. A synformal anticline will have _____
- (A) downward arching beds having younger rocks in core
 - (B) upward arching beds having older rocks in core
 - (C) downward arching beds having older rocks in core
 - (D) upward arching beds having younger rocks in core
35. σ_1 being maximum stress, a thrust fault will be generated when _____
- (A) σ_1 is horizontal
 - (B) σ_1 and σ_2 are horizontal
 - (C) σ_2 and σ_3 are horizontal
 - (D) σ_1 is vertical
36. Younger inclined beds are always found in _____
- (A) Direction of dip
 - (B) Opposite direction of dip
 - (C) Inclined to dip and strike
 - (D) Direction of strike



37. Stress regime under which Mullions form is _____
- (A) Tensile and shearing stress
 - (B) Tensile stress
 - (C) Compressive stress
 - (D) Shearing stress
38. Listric faults are characterized by _____
- (A) Gentle dip at top and steep at bottom
 - (B) Steep dip throughout the fault
 - (C) Steep dip at the top and gentle at the bottom
 - (D) Gentle dip throughout the fault
39. The angle measured on an inclined plane between the strike and any other line that lies in the plane _____
- (A) Pitch
 - (B) True dip
 - (C) Apparent dip
 - (D) Plunge
40. A non-deformational structure _____
- (A) Joint
 - (B) Fold
 - (C) Fault
 - (D) Non-conformity
41. The biostratigraphy of the Cenozoic deep sea records is studied with the help of _____
- (A) Benthic foraminifers because of their long stratigraphic range
 - (B) Planktic foraminifers and nanofossils because of their rapid evolutionary rate
 - (C) Radiocarbon dating combined with planktonic foraminifers
 - (D) Benthic siliceous microfossils
42. Skeletal remains of which of the following are found below the CCD ?
- (A) Foraminifera
 - (B) Coccolithophore
 - (C) Radiolaria
 - (D) Ostracoda



43. What is the correct interpretation of 'Mesozoic Marine Revolution' ?
- (A) Diversification followed by decline of brachiopods
 - (B) Early evolution of mammals
 - (C) Increase in boring predation and rapid adaptation to shell crushing
 - (D) Complete decline of echinoderms
44. Which of the following trilobite is characteristic of Middle Cambrian ?
- (A) Paradoxides
 - (B) Redlichia
 - (C) Olenus
 - (D) Olenellus
45. Choose the option which correctly represents the increasing order of depth of deposition of oceanic sediments and sedimentary rocks.
- (A) Lepidocyclina limestone – Radiolarian ooze – Globigerina ooze – Pteropod ooze
 - (B) Lepidocyclina limestone – Pteropod ooze – Globigerina ooze – Radiolarian ooze
 - (C) Pteropod ooze – Globigerina ooze – Radiolarian ooze – Lepidocyclina limestone
 - (D) Pteropod ooze – Lepidocyclina limestone – Globigerina ooze – Radiolarian ooze
46. Fossilized content of the alimentary canal of animals is known as _____
- (A) Mould
 - (B) Coprolites
 - (C) Trails
 - (D) Burrows
47. The bivalvia shells are jointed together at the dorsal side by _____
- (A) adductor muscle
 - (B) ligament
 - (C) hinge plate
 - (D) palial sinus
48. All biological names should be written in _____
- (A) italics letters
 - (B) capital letters
 - (C) small capital letters
 - (D) either italics or small capital letters
49. Which of the following fossil flora belongs to lower Gondwana ?
- (A) Gangamopteris
 - (B) Ptillophyllum
 - (C) Cladophlebis
 - (D) Sphenopteris



50. Fossils of Archean life are widely represented by
(A) Graptolite (B) Stromatolite
(C) Porifera (D) Echinodermata
51. Arrange the following Gondwana formations from older to younger.
i. Raniganj formation
ii. Barakar formation
iii. Panchet formation
iv. Talchir formation
(A) (i) (iii) (ii) (iv)
(B) (i) (ii) (iii) (iv)
(C) (iv) (iii) (ii) (i)
(D) (iv) (ii) (i) (iii)
52. In Indian Himalayas the Devonian marker horizon is known as
(A) Lipak formation (B) Muth formation
(C) Po formation (D) Spiti shale
53. Choose the correct sequence of division of the Himalayas from South to North.
(A) Trans – Siwalik – Lesser – Higher
(B) Siwalik – Lesser – Higher – Trans
(C) Lesser – Siwalik – Higher – Trans
(D) Higher – Lesser – Siwalik – Trans
54. Syringothyris limestone of Permo-Carboniferous age is associated with _____ basin.
(A) Kashmir (B) Kutch
(C) Cuddapah (D) Jaisalmer
55. Which is the correct stratigraphic sequence of Kutch basin (older to younger) ?
(A) Chari – Patcham – Katrol – Bhuj – Umia
(B) Patcham – Chari – Katrol – Umia – Bhuj
(C) Patcham – Katrol – Chari – Umia – Bhuj
(D) Patcham – Chari – Umia – Bhuj – Katrol



56. The flow regime if Reynold's number is > 2000 is _____
(A) Laminar (B) Critical
(C) Turbulent (D) Transitional
57. Symmetrical ripples are generally formed by _____
(A) Unidirectional flow (B) Oscillatory flow
(C) Storm flow (D) Erosional flow
58. The clastic sediment falling in grain size range of 0.0625 mm and 2 mm will be known as _____
(A) Pebble (B) Sand
(C) Silt (D) Gravel
59. Mud cracks are most likely to form by _____
(A) Gentle oscillatory waves
(B) Periodic exposure to air and drying out
(C) Erosion and deposition
(D) Fast moving water
60. Sandstone type most commonly formed by physical weathering of granite is _____
(A) Quartz arenite (B) Arkose
(C) Grey wacke (D) Shale
61. An offshoot mineralization zone occurring away from the main body of mineral deposit is often termed as _____
(A) Stock
(B) Ore Pocket
(C) Apophyses
(D) Isolated mineral lode
62. Ore texture characterized by a series of concentric curved layers, with curvature convex towards younger surface is called _____
(A) Cumulate (B) Caries
(C) Colloform (D) Annealed



63. 60 to 70% of world Cu production and more than 90% of world Mo production come from which type of deposit ?
(A) Placer (B) Porphyry
(C) SEDEX (D) MVT
64. Epigenetic, low-temperature deposits of galena, sphalerite, fluorite and baryte hosted in carbonate rock would be of which ore deposit category ?
(A) Hypo thermal (B) Sedimentary exhalative
(C) Mississippi valley type (D) Carlin type
65. The oldest economic mineralization in India was of which element ?
(A) Iron (B) Gold
(C) Tin (D) Tungsten
66. Decay of ^{40}K giving rise to ^{40}Cr and ^{40}Ar as daughter nuclides is _____ type of decay.
(A) α decay (B) long chain decay
(C) branched decay (D) fission decay
67. Choose the correct sequence of super continents from the oldest to the youngest.
(A) Kenorland – Nuna – Rodinia – Gondwana
(B) Gondwana – Columbia – Ur – Kenorland
(C) Columbia – Kenorland – Ur – Gondwana
(D) Rodinia – Gondwana – Columbia – Ur
68. Water-laden mass of soil and rock that moves down mountains at a fast pace
(A) Solifluction (B) Creep
(C) Debris flow (D) Rock fall
69. Embryonic, juvenile, mature and terminal stages of the Wilson cycle are represented correctly by _____
(A) East African Rift – Red Sea – Atlantic Ocean – Mediterranean Sea
(B) Atlantic Ocean – Red Sea – East African Rift – Mediterranean Sea
(C) Mediterranean Sea – Atlantic Ocean – Red Sea – East African Rift
(D) Red Sea – East African Rift – Atlantic Ocean – Mediterranean Sea