Roll No. | | | | | | | | |

(Write Roll Number from left side exactly as in the Admit Card)

Signature of Invigilator

Question Booklet Series **X**

PAPER–II **Question Booklet No.**

Subject Code : 27

EARTH SCIENCES

Time : 2 Hours *Maximum Marks: 200*

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page as well as on the OMR Sheet provided.
2. At the commencement of the examination, the Question Booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and verify it:
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page.
   (ii) Faulty booklet, if detected, should be got replaced immediately by a correct booklet from the invigilator within the period of 5 (five) minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.
   (iii) Verify whether the Question Booklet Number is identical with OMR Sheet Number; if not, the full set is to be replaced.
   (iv) After this verification is over, the Question Booklet Series and Question Booklet Number should be entered on the OMR Sheet.
3. This paper consists of One Hundred (100) multiple-choice type questions. All the questions are compulsory. Each question carries *two* marks.
4. Each Question has four alternative responses marked: (A) (B) (C) (D) . You have to darken the circle as indicated below on the correct response against each question.

   Example: (A) (B) ● (D), where (C) is the correct response.
5. Your responses to the questions are to be indicated correctly in the OMR Sheet. If you mark your response at any place other than in the circle in the OMR Sheet, it will not be evaluated.
6. Rough work is to be done at the end of this booklet.
7. If you write your Name, Phone Number or put any mark on any part of the OMR Sheet, except in 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. Do not tamper or fold the OMR Sheet in any way. If you do so, your OMR Sheet will not be evaluated.
9. You have to return the 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 question booklet and duplicate copy of OMR Sheet after completion of examination.
10. **Use only Black Ball point pen.**
11. **Use of any calculator, mobile phone, electronic devices/gadgets etc. is strictly prohibited.**
12. **There is no negative marks for incorrect answer.**

The Question Booklet is encrypted with QR code for security purpose.

Earth Sciences

1. Which on of the following statements is correct regarding the GPS satellites?

(A) The nominal altitude is about 20,200 km

(B) Twenty number of satellites are orbiting the Earth for this purpose

(C) The nominal altitude is about 36,000 km

(D) The inclination of satellite orbit is 65°

2. The oldest age of basaltic crust in present day oceans are

(A) about 4·0 billion years old

(B) about 200 million years old

(C) about 570 million years old

(D) about 20 million years old

3. A granite specimen develops compressive strain of 0·4% when subjected to an axial compressive stress of 50 MPa. Find out the value of young's modulus in the rock.

(A) 80 GPa

(B) 60 GPa

(C) 50 GPa

(D) 100 GPa

4. Which of the following clay minerals is associated with the marine sediments?

(A) Illite

(B) Monmorillionite

(C) Kaolinite

(D) Chlorite

5. Zoning in plagioclase indicates

(A) Liquid immiscibility

(B) Exsolution

(C) Exsolution and liquid immiscibility

(D) Reaction failure

6. In seismic refraction method, the incoming shock waves are picked up by _____.

(A) Wave buoy

(B) Geophone

(C) Altimeter

(D) Thermometer

7. Isopachous rind is a typical product of

(A) Vadose zone precipitation

(B) Phreatic zone precipitation

(C) Deep burial diagenesis

(D) Neomorphism

8. Which of the following currents doesn't belong to Indian ocean gyre?

(A) South Equatorial current

(B) Agulhas current

(C) West Australian current

(D) Gulf stream

9. The changes in the reflectivity/emissivity with time, is called

(A) Spectral variation

(B) Spatial variation

(C) Temporal variation

(D) Diurnal variation

10. Eotve's correction is required for which of the following?

(A) Airborne gravity survey

(B) Airborne magnetic survey

(C) Airborne electromagnetic survey

(D) Airborne radioactive survey

11. You are expected to get carbonatite in association with which of the following?

(A) Granodiorite
(B) Dolerite
(C) Nepheline syenite
(D) Limestone

12. Garnet-biotite geothermometry is based on the principle of following cation exchange.

(A) Intercrystalline
(B) Intracrystalline
(C) Interstitial
(D) Omissional

13. Palaeomagnetism studies often consider the latitude at which a certain rock formed. Which of the following magnetic properties only changes as a function of latitude?

(A) Magnetic polarity
(B) Magnetic reversals
(C) Magnetic inclination
(D) Magnetic intensity

14. When the environmental lapse rate is greater than dry adiabatic lapse rate, air is said to exhibit

(A) Absolute instability
(B) Absolute stability
(C) Conditional stability
(D) Conditional instability

15. The infrared portion of EMR lies between:

(A) 0·4 – 0·7 μm
(B) 0·5 mm to 1 μm
(C) 0·7 – 1·3 μm
(D) 0·7 – 14 μm

16. Which of the following mineral assemblages is associated with the GOSSANS?

(A) Pyrite + pyrrhotite + chalcopyrite
(B) Hematite + limonite + goethite
(C) Cuprite + covellite + bornite
(D) Chlorite + epidote + zoisite

17. In case of points defects in crystals,

(A) Alternate atoms are missing
(B) Two atoms are missing
(C) Only one atom is missing
(D) Atoms are spirally arranged

18. How long does it take a P-wave to travel through the Earth?

(A) 1 minute
(B) 5 minutes
(C) 10 minutes
(D) 20 minutes

19. In which type of sandstone would you expect pseudo matrix?

(A) Arkosic arenite
(B) Quartz arenite
(C) Lith arenite
(D) Subarkosic arenite

20. Which of the following is an example of predominantly Tide-dominated delta?

(A) Mississippi river delta
(B) Mackenzie delta
(C) Ganges-Brahmputra delta
(D) Irrawaddy delta

21. The first seismic wave to arrive after an earthquake is a (i) _____ wave called the (ii) _____.

(A) (i) Surface ; (ii) P-wave

(B) (i) Surface ; (ii) S-wave

(C) (i) Body ; (ii) P-wave

(D) (i) Body ; (ii) S-wave

22. Eh–p^H relationship is represented by which of the following diagrams?

(A) Le Maitre diagram

(B) Sato and Mooniy diagram

(C) Irvine and Baragar diagram

(D) Garrels diagram

23. Khondalite is best represented by which of the following?

(A) Bytownite - diopside - garnet gneiss

(B) Quartz - muscovite - garnet schist

(C) Quartz - plagioclase - K-feldspar gneisses

(D) Quartz - garnet - sillimanite - graphite bearning schists and gneisses

24. The factor that influences the distribution of temperature on the earth's surface—

(A) Insolation

(B) Distance from sea

(C) Terrestrial radiation

(D) Land cover

25. Point-bar deposits are found only in

(A) Neoproterozoic successions

(B) Post Permian successions

(C) Post Silurian successions

(D) Quaternary successions

26. A plain of eroded bed rock in an arid region developed between a mountain and a basin is known as _____.

(A) Pediment

(B) Pediplain

(C) Peneplain

(D) Piedmont

27. What is an arête?

(A) A bowl-shaped depression on a mountain carved out by a valley glacier

(B) A pyramidal mountain peak in a glacially eroded region

(C) A knife– like ridge of rock between two glacially eroded valleys

(D) A U-shaped tributary valley sits high above a deeper valley

28. Which of the following is identified by grey colour, anhedral habit and isotropic characters?

(A) Sphalerite

(B) Cassiterite

(C) Cobaltite

(D) Hematite

29. Which of the following silicates represent Si : O = 2 : 7?

(A) Tectosilicate

(B) Inosilicate

(C) Phyllosilicate

(D) Sorosilicate

30. To induce a positive Bouguer anomaly, a rock unit should have the following property:

(A) Be magnetic

(B) Transmit only P-waves

(C) Be denser than the surrounding materials

(D) Be less dense than the surrounding materials

31. The minimum number of earthquake monitoring stations needed to determine the epicentre of an earthquake.

(A) 5
(B) 4
(C) 3
(D) 1

32. Which of the following is a typical product of grain flow?

(A) Distribution type normal grading
(B) Coarse-tail inverse grading
(C) Coarse-tail normal grading
(D) Distribution type inverse grading

33. The earliest fossils of foraminifera are reported from _____.

(A) Permian rocks
(B) Carboniferous rocks
(C) Lower Silurian rocks
(D) Upper Cambrian rocks

34. The type of landslide that involves slow sliding of sediment above a concave slip surface in called

(A) A Slump
(B) A rock slide
(C) A mud flow
(D) A debris avalanche

35. Which of the following deposits shows strong evidences in support of both hydrothermal and porphyry-type of ore deposit?

(A) Khetri deposit
(B) Zawar deposit
(C) Rajpura – Dariba
(D) Malanjkhand

36. For a biaxial mineral, the acute bisectrix is 'z'; the mineral is

(A) Optically negative
(B) In extinct position
(C) Having very high birefringence
(D) Optically positive

37. At the time of Sunrise or Sunset the position of the Sun is very far away from the earth. The sunlight travels a longer distance and hence scattering of _____ is more.

(A) Blue light
(B) Yellow light
(C) Red light
(D) White light

38. Forced regression is indicated by

(A) Off lap
(B) On lap
(C) Down lap
(D) Top lap

39. Which of the following types of sediment / deposit is associated with very slow average rate of deposition (about 0·001 millimeter per 1000 years)?

(A) Coarse lithogenous sediment
(B) Biogenous ooze
(C) Abyssal clay
(D) Manganese nodule

40. The ratio of the total solar radiant energy returned by a planetary body to the total radiant energy incident on the body, is called:

(A) Reflectance
(B) Reflectance factor
(C) Albedo
(D) Scattering

41. Which of the following is considered as a source rock for East coast bauxite deposit?

(A) Kodurite
(B) Gondite
(C) Khondalite
(D) Charnockite

42. In biaxial optical axis figures, melatopes refer to

(A) a section showing maximum interference colour
(B) a section showing parallel extinction
(C) points of emergence of optic axes
(D) angle between two optic axes

43. When light strikes the particles in the air, the particles absorb some light and radiate the rest in all the direction except the incident direction is known as

(A) Reflection of light
(B) Refraction of light
(C) Scattering of light
(D) Absorbtion of light

44. In an area, a N – S striking 75ºE dipping normal fault gets reactivated in a stress field where maximum principal compressive stress (σ_1 : magnitude 50 MPa) is E – W horizontal and the minimum principal compressive stress (σ_3 : magnitude 10 MPa) is vertical. Determine the value of shear stress on the fault plane.

(A) 20 MPa
(B) 40 MPa
(C) 10 MPa
(D) 50 MPa

45. The Bijli Rhyolite belongs to _____.

(A) Nandgaon Group
(B) Khairagarh Group
(C) Sakoli Group
(D) Sausar Group

46. Which atmosphere layer contains ions and helps in wireless communication?

(A) Mesosphere
(B) Thermosphere
(C) Troposphere
(D) Stratosphere

47. Coal seams associated with the Damuda Series belong to which of the following age?

(A) Carboniferous
(B) Permian
(C) Triassic
(D) Jurassic

48. The force of gravitation between two bodies in the universe does NOT depend on

(A) The distance between them.
(B) The sum of their masses.
(C) The gravitational constant.
(D) The product of their masses.

49. In case of crystallization from a basaltic magma, the early formed plagioclase is calcic, rather than sodic, because

(A) Na^+ goes along with K^+
(B) Ca^{++} is preferred to Na in olivine structure
(C) Ca^{++} is more abundant in the basaltic magma
(D) Ca^{++} enters more readily than Na^+ in to the plagioclase structure

50. The distance between the sun and the earth become shortest on January 4 and is known as

(A) Aphelion
(B) Perihelion
(C) Solstice
(D) Apsis

51. If a N – S striking easterly dipping fault cuts across a north dipping bedded sequence, the fault can be termed as

(A) Strike fault
(B) Dip fault
(C) Bedding fault
(D) Oblique fault

52. Which of the following glaciations is the youngest?

(A) Huronian glaciation
(B) Cryogenian glaciation
(C) Andean-Saharan glaciation
(D) Karoo glaciation

53. The refractive index of the ocean water

(A) Increases with salinity
(B) Increases with temperature
(C) Decreases with salinity
(D) Decreases with temperature

54. Cassiterite deposit in India is associated with which of the following?

(A) Kishangarh syenite
(B) Jagdalpur pegmatite
(C) Malanjkhand granite
(D) Vajrakraroor kimberlite

55. An incompatible element has

(A) D = 5
(B) D = 1
(C) D = 15
(D) D ≈ 0

56. What is a common cause of change of weather?

(A) The Earth's rotation on its axis.
(B) The Earth's revolution around the sun.
(C) The tilt of the Earth's axis.
(D) The movement and interaction of air masses.

57. Which of the following seismic discontinuities occurs immediately below the Moho in the Mantle?

(A) 660 km. discontinuity
(B) Guttenberg discontinuity
(C) Low velocity zone
(D) 450 km. discontinuity

58. Intersection line between two thrust planes in a thrust system is known as

(A) Tip line
(B) Cut-off line
(C) Branch line
(D) Strike line

59. Which of the following options correctly represents the glacial events in older to younger manner?

(A) Mindel, Riss, Wurm, Gunj
(B) Gunj, Mindel, Riss, Wurm
(C) Wurm, Gunj, Mindel, Riss
(D) Riss, Wurm, Mindel, Gunj

60. Cirrus clouds are

(A) Rain clouds
(B) Thick and fleecy
(C) Made of ice crystals
(D) Low cloud layers

61. Pick-up correctly the host rock for Malanjkhand Cu-deposit.

(A) Arkose
(B) Dolomitic limestone
(C) Granite
(D) Quartz reef

62. The satellites which track cloud formation and large storms as well as fires, etc. are

(A) Navigation satellites
(B) Geostationary satellites
(C) Space telescopes
(D) Natural satellites

63. If a bedding plane, a vein and a dike having different orientations are affected by a fault plane and show same amount of dip separation but varying strike separations, the fault can be termed as

(A) Oblique slip fault
(B) Dip slip fault
(C) Strike slip fault
(D) Trace slip fault

64. Which of the following is *not* a palaeoclimate indicator?

(A) Ice core
(B) Corals
(C) Stable isotopes
(D) Sole marks in sedimentary rock

65. Troposphere is the lower most atmospheric zone whose upper boundary lies at about

(A) 115 km above the earth's surface
(B) 8 km and 17 km above the surface at the poles and equator respectively
(C) 700 km above the earth's surface
(D) 1000 km above the earth's surface

66. Formation of crysotile asbestos is connected with which of the following processes?

(A) Alteration of serpentine
(B) Alteration of olivine to serpentine
(C) Hydrothermal alteration
(D) Magmatic liquid accumulation

67. Three plates A,B,C meet at a 'RRR' type triple junction where the three rifts subtend 120° angle with one another. If the velocity of V_{AC} is measured 60 mm/yr, what would be the velocity of V_{BA} ?

(A) 60 mm/yr
(B) 30 mm/yr
(C) 120 mm/yr
(D) 90 mm/yr

68. Resistivity profiling and sounding are taken at _____ angle to the strike, respectively.

(A) 90 degree and 0 degree
(B) 0 degree and 90 degree
(C) 45 degree and 60 degree
(D) 0 degree and 45 degree

69. Graptolites flourished during—

(A) Ordovician
(B) Carboniferous
(C) Triassic
(D) Permian

70. Which physical phenomenon or principle is most often applied in the search for petroleum reservoirs?

(A) Gravitational attraction
(B) Magnetic field distortions
(C) Natural radioactive decay of minerals
(D) Acoustic wave transmission and reflection

71. Which of the following is chiefly used in bauxite exploration?

(A) Mineralogical guide
(B) Stratigraphic guide
(C) Physiographic guide
(D) Structural guide

72. Which of the following Pelecypod taxa has taxodont type of dentition?

(A) Arca
(B) Venus
(C) Cardita
(D) Cardium

73. When seismic waves from an earthquake reach the boundary between the mantle and the outer core?

(A) All of the body waves get refracted
(B) All of the body waves get reflected, but none are refracted
(C) All P-waves get refracted and all S-waves get reflected
(D) All S-waves vanish because they cannot move through a liquid

74. Arsenic concentration in wall-rock or residual soil or stream sediments is used as path-finder element for which of the following ore deposit?

(A) Complex Pb – Zn – Ag deposit
(B) Porphyry Cu deposit
(C) Vein – types Au deposit
(D) Epigenetic sulphide deposit

75. In which tectonic setting do we find olistostome?

(A) Transform boundary
(B) Mid-oceanic rift-ridge
(C) Accretionary complex
(D) Back-arc basin

76. Fossil fecal pellets of ancient animals are described as _____.

(A) Gastroliths
(B) Coprolite
(C) Beekite rings
(D) Pseudo fossils

77. The Earth has a magnetic field because

(A) Magnetic minerals are common at temperatures above the Curie point
(B) It has a magnetic iron-nickel core
(C) All planets have magnetic fields when they form
(D) The liquid outer core creates an electric current which induces a magnetic field

78. Highest δC^{13} values associated with which of the following marine deposits?

(A) Marine carbonate deposits
(B) Marine algal deposits
(C) Black shale
(D) Petroleum

79. The formation factor is related to

(A) Resistivity of rock
(B) Permeability
(C) Porosity of rock
(D) The resistivity of fluid in the rock

80. Which of the following phase change occurs at 660 km. depth in the mantle?

(A) Olivine $\rightarrow$ Wadsleyite
(B) Spinel $\rightarrow$ Perovskite
(C) Olivine $\rightarrow$ Perovskite
(D) Wadsleyite $\rightarrow$ Spinel

81. The skeleton of an entire coral colony is described as _____.

(A) Corallum
(B) Corallite
(C) Collumella
(D) Rhabdosome

82. A compass spins at the north pole because

(A) It is too cold for a compass to work properly
(B) The magnetic declination changes through time
(C) The magnetic field direction constantly reverses
(D) The magnetic field is inclined vertically with respect to the surface

83. Which of the following elements is least mobile in the secondary environment?

(A) Ca
(B) Mg
(C) K
(D) Ti

84. Which of the following Cratons does not share a common margin with the Eastern Ghats belt?

(A) Aravalli-Bundelkhand Craton
(B) Singhbhum Craton
(C) Bastar Craton
(D) Eastern Dharwar Craton

85. The median region of the Cephalon that inflated in Trilobites is _____.

(A) Cheeks
(B) Glabella
(C) Axial furrows
(D) Pleuron

86. Which one of the following helps to identify the objects on the earth surface?

(A) Atmospheric window
(B) Signature
(C) Radiometric error
(D) Temporal variation

87. Which of the following isotope is calibrated with the help of SMOW (Standard Mean Ocean Water) ?

(A) C Isotopes
(B) O Isotopes
(C) H Isotopes
(D) N Isotopes

88. Iron ore is found in which stratigraphic unit in the Bastar Craton?

(A) Khairagarh Group
(B) Indravati Group
(C) Abujhmar Group
(D) Bailadila Group

89. The ammonoids became extinct at the

(A) End of the Carboniferous

(B) End of the Permian

(C) End of the Cretaceous

(D) End of the Eocene

90. When a mineral is replaced by another mineral, without any change in the external form, is called as

(A) Paramorph

(B) Pseudomorph

(C) Polymorph

(D) Isomorph

91. The Simlipal basin of Eastern India represents a

(A) Granite-Greenstone terrane

(B) Volcano – sedimentary basin

(C) Granulite terrane

(D) Mobile belt

92. Deltidium is found in

(A) Brachiopods

(B) Gastropods

(C) Pelecypods

(D) Cephalopods

93. The property which defines the resistance of stone to rubbing and grinding action under the wheel of the traffic is called

(A) Abrasive resistance

(B) Crushing resistance

(C) Hardness

(D) Specific gravity

94. Which of the following elements is closely associated with the Ta?

(A) Ge

(B) Ga

(C) V

(D) Nb

95. Which of the following structures in a ductile shear zone cannot be used to infer sense of shear?

(A) ϕ – type clasts

(B) σ – type clasts

(C) S – C febric

(D) Mica fish

96. When referring to ground water, (i) _____ refers to the volume percentage of water that rocks can store, whereas (ii) _____ refers to the ability of water to flow through the rock.

(A) (i) Porosity (ii) Permeability

(B) (i) Porosity (ii) Infiltration capacity

(C) (i) Permeability (ii) Porosity

(D) (i) Infiltration capacity (ii) Permeability

97. Which of the following is correctly linked with the phenomenon of lanthanide contraction?

(A) Contraction of electrons in the outer shell

(B) Contraction of electrons in the inner shell

(C) Building up of an outer electron shell instead of destruction of new shell

(D) Building up of inner electron shell instead of new shell

98. If the upper crust has an average density of 2600 kg/m^3, at what depth would the lithostatic pressure be 50 MPa? (g = 9.81 ms^{-2})

(A) 2960 m

(B) 1900 m

(C) 1960 m

(D) 2900 m

99. Which one of the following devices is used to measure potential evapotranspiration?

(A) Odometer

(B) Lysimeter

(C) Nephelometer

(D) Hygrometer

100. A basalt specimen with cross sectional area of 1500 mm^2 is subjected to an axial force of 4·5 KN. Determine the amount of stress developed in the rock.

(A) 3 MPa

(B) 5 MPa

(C) 2·5 MPa

(D) 6 MPa

Space for Rough Work

Space for Rough Work

Space for Rough Work