COMBINED GEO-SCIENTIST (P) EXAM-2023

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T.B.C. : SDGH–B–GHY **Test Booklet Series**

A

Serial No. 1008865

TEST BOOKLET

PAPER—II

(Geology/Hydrogeology)

Time Allowed : Two Hours **Maximum Marks : 300**

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1. The main difference between gradualism and catastrophism is based on which one of the following geomorphic attributes?

(a) Geomorphic rate

(b) Geomorphic process

(c) Geomorphic law

(d) Geomorphic state

2. Which one of the following processes played the most dominant role during evolutionary stages of the atmosphere in defining the present-day oxygen concentration in the atmosphere?

(a) Release of water vapour during volcanic eruption

(b) Water vapour decomposition because of solar radiation

(c) Photosynthesis

(d) Oxidation of minerals

3. The zone, marking the end of decrease in temperature with increase in altitude, is known as

(a) mesopause

(b) stratopause

(c) tropopause

(d) heliopause

4. Match List–I with List–II and select the correct answer using the code given below the Lists :

List–I (Landform)	*List–II (Landform characteristic)*
A. Laccoliths	1. Vast, saucer-shaped and layered intrusions of basic rocks
B. Phacoliths	2. Sills that have thickened to produce domes
C. Lopoliths	3. The largest intrusive bodies of basic rocks
D. Stocks	4. Lens-shaped masses associated with folds

Code :

(a)	A	B	C	D
	3	1	4	2
(b)	A	B	C	D
	2	1	4	3
(c)	A	B	C	D
	3	4	1	2
(d)	A	B	C	D
	2	4	1	3

5. Consider the following statements regarding continental lithosphere :

1. It consists of buoyant low-density crust and upper mantle.
2. Part of the lithosphere takes part in the mantle convection process.
3. Its average thickness is about 150 km.

Which of the statements given above is/are correct?

(a) 1 and 2 only

(b) 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

6. The critical temperature at which all magnetic materials become non-magnetic is known as

(a) blocking temperature

(b) Curie point

(c) phase transition

(d) secular variation

7. Consider the following statements regarding graded river :

1. It is characterized by necessary channel slope and shape to maintain minimum velocity required to transport sediment.
2. It is characterized by sandy sediments.
3. The graded river is considered as channel in equilibrium condition.
4. Such river will not be affected by any external disturbance like faulting across the channel.

Which of the statements given above are correct?

(a) 1 and 2 only

(b) 1, 2 and 3 only

(c) 1 and 3 only

(d) 1, 2, 3 and 4

8. Which one of the following is ***not*** associated with sabkhas?

(a) Level of the groundwater table controls the land surface elevation

(b) Tidal flat dominated by evaporites

(c) Constant wind activity at the surface

(d) Subtidal environment

9. Consider the following statements regarding incised meander :

1. It is a depositional feature.
2. It represents relative drop in base level.
3. It generally flows in steep, narrow bedrock valley.
4. It is associated with floodplains.

Which of the statements given above are correct?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 2, 3 and 4 only

(d) 1, 2, 3 and 4

10. Match List–I with List–II and select the correct answer using the code given below the Lists :

List–I (Landform)	*List–II (Geomorphic agent)*
A. Blind valley	1. River
B. Hanging valley	2. Wind
C. Incised valley	3. Groundwater
D. Loess	4. Glacier

Code :

	A	B	C	D
(a)	3	1	4	2
(b)	3	4	1	2
(c)	2	1	4	3
(d)	2	4	1	3

11. A cube-shaped rock piece having one dimension of 2 m was broken into 8 cubes having one dimension of 1 m. What will be the change in surface area because of this mechanical weathering process?

(a) No change

(b) Surface area will change to one and half times

(c) Surface area will be doubled

(d) Surface area will increase to four times

12. In a basaltic terrain, which one of the following clay minerals will be present in low mean annual rainfall?

(a) Kaolinite

(b) Bauxite

(c) Smectite

(d) Gibbsite

13. Which one of the following materials shows a combination of recoverable elastic strain and permanent deformation, analogous to the motion governed by friction block and a spring connected in series?

(a) Visco-plastic (Bingham)

(b) Firmo-viscous (Kelvin)

(c) Visco-elastic (Maxwell)

(d) Elastic-plastic (Prandtl)

14. Match List–I with List–II and select the correct answer using the code given below the Lists :

List–I (Term)		*List–II (Description)*
A. Linear strain	1.	Characterized by having two of the principal stretches equal to one
B. Shear strain	2.	Change in length parallel to given coordinate
C. Uniaxial strain	3.	Change in shape by changes in angle(s)
D. Pure strain	4.	Principal axes of strain are constant in orientation relative to reference coordinate system

Code :

	A	B	C	D
(a)	4	3	1	2
(b)	2	3	1	4
(c)	2	1	3	4
(d)	4	1	3	2

15. Folds in which the hinge zones are completely detached from the limbs, are called

(a) intrafolial folds

(b) rootless folds

(c) concentric folds

(d) chevron folds

16. Which one of the following linear deformational structures is found restricted to the interface between a competent rock and an incompetent rock?

(a) Slickenside

(b) Mullion

(c) Asperity

(d) Intersection lineation

17. Consider the following statements regarding faults :

1. The terms 'ramps' and 'flats' are used for steep and sub-horizontal portions of any fault surface.
2. Sinistral-sense strike-slip faults are also called right-lateral faults.
3. Two separate normal faults dipping towards each other create a down-thrown block known as graben.
4. A fault that steepens downward is called listric fault while downward-flattening faults are often called antilistric.

Which of the statements given above are ***not*** correct?

(a) 3 and 4

(b) 2 and 4

(c) 1 and 4

(d) 1, 2 and 3

18. Fold that arches sideways is termed as

(a) anticlinal fold

(b) synclinal fold

(c) neutral fold

(d) antiformal fold

19. The difference between maximum and minimum principal stresses ($\sigma_1 - \sigma_3$) is called

(a) hydrostatic stress

(b) deviatoric stress

(c) uniaxial stress

(d) differential stress

20. Which one of the following statements regarding fracture is ***not*** correct?

(a) Increasing the confining pressure makes it necessary to increase the differential stress in order to fracture a rock.

(b) Fracture initiation requires a differential stress that exceeds the strength of the rock.

(c) In the brittle regime, a deforming rock accumulates only elastic strain before it fractures at a certain critical level.

(d) Compressive strength of a rock is always less than its tensile strength.

21. Joint surfaces that display a regular pattern of subtle ridges and grooves diverging from a point or a central axis are known as

(a) pinnate structure

(b) plumose structure

(c) Wallner lines

(d) feather structure

22. Which one of the following sets of combinations you should expect to find while carrying out fieldwork in a fault/ shear zone?

(a) Striations, skarn, baked contact

(b) Pseudotachylite, gouge, mylonite

(c) Grooves, chill zone, graded bedding

(d) Gouge, skarn, grooves

23. In a structure contour map, an area is entirely enclosed by one or more contours. This structure is known as

(a) ring structure

(b) Schuppen structure

(c) closed structure

(d) imbricate structure

24. Which of the following statements regarding rose diagram are correct?

1. The intervals of azimuths are plotted as pie-shaped segments of a circle in their true orientation.
2. The length of the radius of the circle is not proportional to the frequency of measurements having that orientation.
3. Rose diagrams are used for displaying features as direction of sediment transport and strike of vertical joint.
4. Rose diagrams are histograms for which the orientation axis is transferred into a circle to give true angular plot.

Select the correct answer using the code given below.

(a) 1 and 3 only

(b) 1, 3 and 4 only

(c) 2, 3 and 4 only

(d) 1, 2, 3 and 4

25. Which one among the following pairs is correctly matched?

(Crystal System)		*(Symmetry)*
(a) Monoclinic	:	2/m 2/m 2/m
(b) Orthorhombic	:	6/m 2/m 2/m
(c) Tetragonal	:	4/m 2/m 2/m
(d) Hexagonal	:	2/m

26. The mineral pyrite (FeS_2) belongs to which one of the following classes of isometric crystal system?

(a) Diploidal class

(b) Hextetrahedral class

(c) Hexoctahedral class

(d) Tetartoidal class

27. A crystal face has an intercept of $6a : 4b : \infty c$. The appropriate Miller indices for this face will be

(a) 230

(b) 100

(c) 110

(d) 321

28. The tetrahedra repeat distance in a pyroxenoid chain is

(a) 5·2 Å

(b) 7·3 Å

(c) 8·9 Å

(d) 17·8 Å

29. Lizardite $[Mg_3Si_2O_5(OH)_4]$ belongs to which one of the following mineral groups?

(a) Serpentine

(b) Chlorite

(c) Epidote

(d) Illite

30. Akermanite belongs to which one of the following silicate groups?

(a) Tectosilicates

(b) Phyllosilicates

(c) Sorosilicates

(d) Inosilicates

31. Which one of the following mineral groups exhibits the peristerite, Bøggild and Huttenlocher lamellar intergrowths?

(a) Plagioclase

(b) Pyroxene

(c) Amphibole

(d) Mica

32. Forsterite-Fayalite series of olivine group of minerals is an example of

(a) solid solution

(b) polymorphism

(c) paramorphism

(d) pseudomorphism

33. Which one of the following pairs of minerals is ***not*** an example of polymorphism?

(a) Calcite and Aragonite

(b) Tridymite and Cristobalite

(c) Pyrite and Marcasite

(d) Edenite and Enstatite

34. Some specimens of plagioclases show spectacular colours ranging from blue to green/yellow and red. This iridescence is called

(a) asterism

(b) labradorescence

(c) fluorescence

(d) phosphorescence

35. Which of the following statements regarding micas is/are correct?

1. Micas are silicates with a layered crystal structure in which sheets of M-(O, OH) octahedra are sandwiched between two inward pointing sheets of linked T-O tetrahedra.
2. In muscovite, two out of three octahedral sites are occupied mainly by Al and in biotite, all octahedral sites are mainly occupied by Fe and Mg.
3. Muscovite differs from phlogopite and biotite in having its optic axial plane perpendicular to (010) and usually has higher 2V than phlogopite and biotite.

Select the correct answer using the code given below.

(a) 1 only

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1, 2 and 3

36. Which of the following statements regarding amphiboles is/are correct?

1. The members of amphibole group of minerals occur in a wide range of P-T environments and are the common constituents of igneous and metamorphic rocks.
2. The essential feature of the structures of all amphiboles is the presence of (Si, Al)-O tetrahedra linked to form chains having composition $(Si, Al)_4O_{11}$.
3. Basal sections of amphiboles show two sets of cleavages with cleavage angle 87° to 88°.

Select the correct answer using the code given below.

(a) 1 only

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1, 2 and 3

37. Consider the following statements regarding the association between magma series and plate tectonic settings :

1. Tholeiitic magmas are produced only at divergent plate boundaries.
2. Calc-alkaline magmas are produced only at convergent plate margins.
3. Alkaline magmas are produced at convergent and within plate settings.
4. Tholeiitic magmas are produced at divergent, convergent and within plate settings.

Which of the statements given above are correct?

(a) 1 and 3 only

(b) 1, 2 and 3

(c) 2, 3 and 4

(d) 2 and 4 only

38. Ultramafic volcanic rock with spinifex texture is called

(a) kimberlite

(b) boninite

(c) harzburgite

(d) komatiite

39. Concordant lens-shaped (convex upward) igneous intrusion is known as

(a) laccolith

(b) cupola

(c) phacolith

(d) sill

40. The texture in a basaltic rock where angular interstices between plagioclase grains are occupied by pyroxene, is called

(a) vitrophyric

(b) ophitic

(c) sub-ophitic

(d) intergranular

41. Volcanic debris when mixes with sufficient water (and produces mudflow) is termed as

(a) tuff

(b) lahar

(c) ignimbrite

(d) block-and-ash deposit

42. In the diopside-albite-anorthite ternary system, the curve along which both diopside and plagioclase can coexist is called

(a) cotectic curve

(b) ternary eutectic

(c) tie-line curve

(d) peritectic line

43. In many dykes, phenocryst phases get concentrated towards the centre of the dykes away from the wall due to

(a) flow segregation

(b) magma mixing

(c) vapour phase exsolution

(d) country rock assimilation

44. Which one among the following basalt types is depleted in the light rare earth elements?

(a) Continental tholeiitic basalt

(b) Alkali olivine basalt

(c) High-K island-arc basalt

(d) Normal mid-oceanic ridge basalt (N-MORB)

45. Which one of the following pairs of minerals is formed during the fenitization of a carbonatite?

(a) Aegerine and Orthoclase

(b) Orthoclase and Plagioclase

(c) Plagioclase and Microcline

(d) Microcline and Aegerine

46. Granitic rock containing higher Al_2O_3 and having mica, garnet and cordierite plus normative corundum is termed as

(a) M-type granitoid

(b) I-type granitoid

(c) S-type granitoid

(d) A-type granitoid

47. Which one of the following magma types represents a high liquidus temperature (> 1650 °C) and is mostly restricted to Archean time?

(a) Komatiite

(b) Kimberlite

(c) Continental alkaline

(d) Ultra-alkaline and silica-poor alkaline

48. Which one of the following basalt types is generated in within-plate setting, aided by mantle plume activity?

(a) Volcanic arc basalt

(b) Mid-ocean ridge basalt

(c) Island-arc tholeiite

(d) Continental flood basalt

49. 'Melanosome' is a term associated with which one of the following metamorphic rocks?

(a) Mylonite

(b) Pseudotachylite

(c) Migmatite

(d) Hornfels

50. 'Pseudotachylite' is commonly formed due to

(a) frictional heating

(b) thermal metamorphism

(c) hydrothermal metamorphism

(d) retrograde metamorphism

51. Which one among the following represents the metamorphism of a local extent?

(a) Impact metamorphism

(b) Burial metamorphism

(c) Ocean-floor metamorphism

(d) Subduction metamorphism

52. Perfectly developed foliation independent of bedding, resulting from the parallel arrangement of very fine-grained (not visible by unaided eye) phyllosilicates in metamorphic rocks, is called

(a) lineation

(b) crenulation cleavage

(c) fracture cleavage

(d) slaty cleavage

53. Snowball garnet texture is an example of which one of the following types of matrix-porphyroblast relations?

(a) Pretectonic

(b) Syntectonic

(c) Posttectonic

(d) Intertectonic

54. Consider the following statements :

Statement–1 :

Metamorphic fabrics commonly reflect the alignment of some or all of the constituent mineral grains in particular orientations.

Statement–2 :

Preferred orientations may develop as a result of mechanical rotation of originally asymmetric grains into new orientations.

Which one of the following is correct in respect of the above statements?

(a) Statement–1 is correct but Statement–2 is incorrect

(b) Both Statement–1 and Statement–2 are correct

(c) Statement–1 is incorrect but Statement–2 is correct

(d) Both Statement–1 and Statement–2 are incorrect

55. The texture in which porphyroblasts show small folds in the inclusion trails within it is called

(a) granoblastic texture

(b) decussate texture

(c) mortar texture

(d) helicitic texture

56. Granoblastic-polygonal is a texture commonly present in

(a) quartzite

(b) schists

(c) phyllites

(d) slates

57. What degree of freedom can be ascribed to a zone, if P and T are considered as only intensive variables?

(a) Zero *(b)* One

(c) Two *(d)* Three

58. The reaction

muscovite + quartz = sillimanite + K-feldspar + H_2O

at a fixed P_{H_2O} can be termed as

(a) decarbonation reaction

(b) continuous reaction

(c) discontinuous reaction

(d) solid-solid reaction

59. In the blueschist-facies rock, which one of the following minerals shows the blue colour prominently?

(a) Lawsonite

(b) Jadeite

(c) Glaucophane

(d) Actinolite

60. An eclogite-facies metamorphic rock with a basic igneous protolith will display the characteristic assemblage of

(a) hornblende + plagioclase ± epidote ± garnet

(b) orthopyroxene + clinopyroxene + plagioclase ± hornblende ± garnet ± olivine

(c) omphacite + garnet without plagioclase

(d) glaucophane + albite ± lawsonite

61. Grain size sorting is extremely poor in

(a) aeolian deposit

(b) glacial deposit

(c) fluvial deposit

(d) marine deposit

62. Which one of the following types of grain contacts signifies maximum amount of compaction in a sandstone?

(a) Concavo-convex contacts

(b) Sutured contacts

(c) Long contacts

(d) Point contacts

63. In a sedimentary rock, different proportions of gravel, sand and mud-sized grains are present. What should be the minimum required volume % of gravel component to classify that rock as a conglomerate?

(a) 15%

(b) 30%

(c) 50%

(d) 70%

64. Which one of the following biogenic structures can be categorized as 'bioerosion structure'?

(a) Burrow

(b) Boring

(c) Fecal pellet

(d) Stromatolite

65. In modern ocean basins, zoophycos occurs in

(a) rocky coast

(b) sandy coast

(c) sublittoral zone

(d) bathyal zone

66. Which one of the following sedimentary structures provides sense of direction of grain movement?

(a) Parting lineation

(b) Longitudinal ridge

(c) Gutter

(d) Prod mark

67. Crystals, crystal fragments, glass fragments and rock fragments that have been released from pre-existing volcanic rock by weathering or erosion and transported from their place of origin by air, water or ice are known as

(a) pyroclasts

(b) epiclasts

(c) autoclasts

(d) tuffs

68. A grain-supported carbonate rock with intergranular spaces occupied by clay and fine silt-sized particles is called

(a) grainstone

(b) wackestone

(c) packstone

(d) boundstone

69. Epsilon cross-stratification is characteristically formed in

(a) meandering channel

(b) inner shelf

(c) upper intertidal flat

(d) alluvial fan

70. Debris flow products generally assume which one of the following geometries?

(a) Spherical

(b) Convex up base and flat top

(c) Flat base and convex top

(d) Convex base and concave top

71. Which one of the following features bears the unequivocal signature of aeolian deposition?

(a) Common presence of ripple drift

(b) Presence of parting lineation

(c) Regular alternation between grainfall and grainflow strata

(d) Poorly sorted sediment

72. All calcium carbonate sediments with their original mixed mineralogy, after diagenesis, get transformed into

(a) low-magnesium calcite

(b) high-magnesium calcite

(c) aragonite

(d) vaterite

73. The oldest known bird fossil, *Archaeopteryx* was recovered from

(a) Late Jurassic of Germany

(b) Middle Jurassic of Germany

(c) Late Jurassic of China

(d) Middle Jurassic of Australia

74. Speciation occurring in planktonic micro-organisms on either side of a land barrier created due to closing of some ocean gateways, is an example of

(a) allopatric speciation

(b) peripatric speciation

(c) parapatric speciation

(d) sympatric speciation

75. There are many ways to explain evolutionary trends in fossils including 'punctuated equilibrium' and 'phyletic gradualism'. In the context of evolution of trilobites, which one of the following statements is ***not*** correct?

(a) Change in the number of pygidial ribs in trilobites is an example of punctuated equilibrium.

(b) Change in the number of pygidial ribs in trilobites is an example of phyletic gradualism.

(c) Increasing/Decreasing number of thoracic segments is an example of phyletic gradualism.

(d) Effacement, the loss of surface details in the cephalon, pygidium is an example of phyletic gradualism.

76. Exogastric Cephalopoda exhibits

(a) venter on the outside and dorsum on the inside of the coiling

(b) venter on the inside and dorsum on the outside of the coiling

(c) no distinction between venter and dorsum

(d) completely straight shell

77. Which one of the following is an example of brachiopod with strophic shells?

(a) *Visbyella*

(b) *Magellania*

(c) *Terebratula*

(d) *Rhynchonella*

78. Which one of the following Lamellibranch genera is ***not*** found in recent time?

(a) *Pecten*

(b) *Spondylus*

(c) *Ostrea*

(d) *Exogyra*

79. Every geological era is subdivided based on evolution of some particular fossil group in the geological time scale. Match List–I with List–II and select the correct answer using the code given below the Lists :

List–I (Fossil group)	*List–II (Geological time)*
A. Planktic foraminifera	1. Paleozoic
B. Cephalopods	2. Neogene
C. Conodonts	3. Paleogene
D. Larger foraminifera	4. Mesozoic

Code :

	A	B	C	D
(a)	2	4	1	3
(b)	2	1	4	3
(c)	3	4	1	2
(d)	3	1	4	2

80. Which one among the following is a Middle Pleistocene hominine species?

(a) *Homo heidelbergensis*

(b) *Australopithecus anamensis*

(c) *Paranthropus robustus*

(d) *Homo sapiens*

81. Which one of the following early horses was grazer?

(a) *Pliohippus*

(b) *Hyracotherium*

(c) *Mesohippus*

(d) *Parahippus*

82. Which one of the following statements regarding application of foraminifera in understanding paleoceanography and paleoclimate is ***not*** correct?

(a) Stable oxygen isotope composition ($\delta^{18}O$) of planktic foraminifera depends on temperature of calcification and isotopic composition of ambient ocean water.

(b) Closing and opening of the ocean gateways can be inferred from biogeographic studies of planktic foraminifera.

(c) During glacial stages, the $\delta^{18}O$ of benthic foraminifera shows lower values (decrease).

(d) During glacial stages, the $\delta^{18}O$ of benthic foraminifera shows higher values (increase).

83. Which one of the following is ***not*** a cordaitalean leaf fossil?

(a) *Cordaites*

(b) *Noeggerathiopsis*

(c) *Euryphyllum*

(d) *Cladophlebis*

84. The ostracods of the order Paleocopida dominated the Paleozoic, but were almost wiped out at the end of Permian. They are now represented by the lone enigmatic genus

(a) *Manawa*

(b) *Bradoria*

(c) *Indiana*

(d) *Beyrichana*

85. Match List–I with List–II and select the correct answer using the code given below the Lists :

List–I (Mother element)	*List–II (Daughter element)*
A. U^{235}	1. N^{14}
B. Rb^{87}	2. Ar^{40}, Ca^{40}
C. K^{40}	3. Sr^{87}
D. C^{14}	4. $Pb^{207}-7He^{4}$

Code :

	A	B	C	D
(a)	4	2	3	1
(b)	1	3	2	4
(c)	1	2	3	4
(d)	4	3	2	1

86. Rock formations deposited at the same stage of the earth's evolutionary history are referred to as

(a) syntaxial

(b) ditaxial

(c) monotaxial

(d) homotaxial

87. The principle that facies which occur in conformable vertical successions of strata also occur in laterally adjacent modern environments is known as

(a) Walther's law of facies

(b) law of superposition

(c) law of uniformitarianism

(d) law of faunal succession

88. Which one of the following is an example of an era?

(a) Cenozoic

(b) Miocene

(c) Triassic

(d) Cambrian

89. Which one of the following arrangements of the lithostratigraphic units shows the correct order of decreasing age of their formation/deposition?

(a) Sargur Group > Vindhyan Supergroup > Gondwana Supergroup > Siwalik Supergroup

(b) Siwalik Supergroup > Vindhyan Supergroup > Sargur Group > Gondwana Supergroup

(c) Gondwana Supergroup > Siwalik Supergroup > Vindhyan Supergroup > Sargur Group

(d) Sargur Group > Siwalik Supergroup > Vindhyan Supergroup > Gondwana Supergroup

90. The stratigraphic position of the Kushalgarh limestone is

(a) above the Alwar Group and below the Ajabgarh Group

(b) above the Ajabgarh Group and below the Alwar Group

(c) younger than the Malani volcanics

(d) older than the Raialo limestone

91. Consider the following quartzite rock formations of India :

1. Irlakonda quartzite
2. Srisailam quartzite
3. Gulcheru quartzite

Which one of the following represents the correct stratigraphic order (older to younger)?

(a) 1→2→3

(b) 3→2→1

(c) 3→1→2

(d) 1→3→2

92. The Vindhyan Supergroup consists of Lower Vindhyan (Semri Group) and Upper Vindhyan (Kaimur, Rewa and Bhander Groups). Which one of the following statements regarding Vindhyan Supergroup is ***not*** correct?

(a) The Kaimur Group is dominated by calcareous rocks and has preserved stromatolites.

(b) The Lower Vindhyan (Semri Group) is dominated by calcareous rocks and has excellently preserved stromatolites.

(c) The Kaimur and Rewa Groups are mostly consisting of siliciclastic rocks.

(d) The basal conglomerate occurs at the base of Semri Group.

93. Which one of the following fossils is reported from both Kaladgi Group as well as Semri Group?

(a) *Cryptozona* sp.

(b) *Collenia* sp.

(c) *Archaeofavosia* sp.

(d) *Priscogalea* sp.

94. Consider the following statements regarding Umaria Marine Bed (UMB) and Manendragarh Marine Bed (MMB) :

1. UMB is older than MMB.
2. MMB is older than UMB.
3. Both UMB and MMB have yielded different assemblages of fossils.

Which of the statements given above is/are correct?

(a) 1 only

(b) 2 and 3

(c) 1 and 3

(d) 2 only

95. Consider the following statements regarding island arcs :

1. They are long curved chain of oceanic island formed by intense and pure rhyolitic volcanism.
2. They are long curved chain of oceanic island formed by intense andesitic volcanism.
3. Most island arcs originate on the oceanic crust between the oceanic trenches and continental areas.

Which of the statements given above are correct?

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

96. Lower Cambrian trilobite *Redlichia* is known from

(a) salt pseudomorph bed

(b) magnesium sandstone

(c) neobolus shale

(d) purple sandstone

97. Which one of the following pairs of metal and its corresponding ore mineral is correctly matched?

(a) Nickel : Pentlandite

(b) Zinc : Galena

(c) Titanium : Cassiterite

(d) Uranium : Wolframite

98. An interlacing of mineralized veinlets traversing host rocks is known as

(a) ladder veins

(b) saddle reefs

(c) fissure veins

(d) stockworks

99. Which one of the following terms refers to precipitation and growth of minerals in veins exhibiting a banded appearance?

(a) Vesicular fill

(b) Crustification

(c) Breccia fill

(d) Fracture fill

100. Which one of the following mineral assemblages refers to 'black ore' associated with Kuroko-type deposits?

(a) Magnetite–ilmenite–rutile

(b) Chalcopyrite–covellite–molybdenite

(c) Sphalerite–galena–baryte

(d) Pyrite–chalcopyrite–digenite

101. Which one of the following statements regarding eluvial placers is ***not*** correct?

(a) Eluvial placers are formed due to meandering of rapidly flowing stream.

(b) Eluvial placers are formed upon hill slopes.

(c) Eluvial placers are formed without stream action.

(d) Eluvial placers are considered as an initial stage in the formation of stream placers.

102. Consider the following statements regarding alterations during mineral deposits formation :

Statement–1 :

Propylitic alteration is characterized by the development of montmorillonite, pyrite and tourmaline.

Statement–2 :

Fenitization is associated with carbonate hosted deposits and is characterized by the development of talc, serpentine and orthoclase.

Which of the statements given above is/are correct?

(a) Both 1 and 2

(b) 1 only

(c) 2 only

(d) Neither 1 nor 2

103. Match List–I with List–II and select the correct answer using the code given below the Lists :

List–I (Deposit type)	*List–II (Process of formation)*
A. Stratiform chromite	1. Residual liquid segregation
B. Copper-nickel sulphides	2. Late magmatic injection
C. Pegmatite	3. Liquid immiscibility
D. Layers of titaniferous magnetite	4. Early magmatic

Code :

(a)

A	B	C	D
4	3	2	1

(b)

A	B	C	D
4	2	3	1

(c)

A	B	C	D
1	3	2	4

(d)

A	B	C	D
1	2	3	4

104. Consider the following statements regarding formation of metasomatic mineral deposits :

Statement–1 :

Mafic-ultramafic intrusives are commonly associated with metasomatic deposits as they can expel large quantity of mineralizing fluids compared to felsic intrusives.

Statement–2 :

Carbonate rocks host many metasomatic deposits compared to arenaceous sedimentary rocks.

Which of the statements given above is/are correct?

(a) 1 only

(b) Both 1 and 2

(c) 2 only

(d) Neither 1 nor 2

105. Under tropical and subtropical weathering conditions, rocks such as dunite and peridotite undergo laterization. Which one of the following silicate minerals is formed in such laterites?

(a) Goethite

(b) Garnierite

(c) Gibbsite

(d) Grunerite

106. Which one of the following statements regarding coal is ***not*** correct?

(a) Peat represents the first stage in the formation of coal.

(b) Lignite has high moisture content.

(c) Bituminous coal has low moisture and high volatile content.

(d) Anthracite has low sulphur content.

107. Consider the following statements regarding petroleum reservoir and caprocks :

1. Clay has low porosity and less permeability, therefore, it is not a suitable reservoir rock.
2. The most suitable reservoir rocks are sands and sandstones.
3. Shale and clay are pervious caprocks and cannot retain petroleum.

Which of the statements given above is/are correct?

(a) 1 and 2

(b) 1 only

(c) 2 and 3

(d) 2 only

108. Match List–I with List–II and select the correct answer using the code given below the Lists :

List–I (Mineral deposit)	*List–II (Location)*
A. Diamond	1. Amarkantak, Madhya Pradesh
B. Baryte	2. Mangampeta, Andhra Pradesh
C. Bauxite	3. Chalk Hills, Tamil Nadu
D. Magnesite	4. Majhgawan, Madhya Pradesh

Code :

	A	B	C	D
(a)	4	1	2	3
(b)	4	2	1	3
(c)	3	1	2	4
(d)	3	2	1	4

109. The pore water pressure at the water table in an unconfined aquifer is

(a) equal to the atmospheric pressure

(b) much greater than the atmospheric pressure

(c) much less than the atmospheric pressure

(d) not dependent on the atmospheric pressure

110. The amount of water held in soil after wetting and subsequent drainage has become negligibly small, is called

(a) available water

(b) wilting point

(c) field capacity

(d) gravitational water

111. Consider the following statements regarding effective porosity of rocks :

1. Effective porosity is the porosity available for fluid flow.
2. Effective porosity arises due to interconnected pore spaces.
3. For unconsolidated porous media, porosity and effective porosity always have different values.

Which of the statements given above are correct?

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

112. Consider the following statements regarding aquifer property :

1. Hydraulic conductivity is a function of the properties of the porous media and the fluid passing through it.
2. Intrinsic permeability is a function of the fluid passing through the porous media only.
3. Intrinsic permeability is a function of the properties of the porous media only.

Which of the statements given above is/are correct?

(a) 2 only

(b) 1 and 2

(c) 3 only

(d) 1 and 3

113. Match List–I with List–II and select the correct answer using the code given below the Lists :

List–I (Aquifer property)	*List–II (Dimension)*
A. Porosity	1. LT^{-1}
B. Hydraulic conductivity	2. Dimensionless
C. Specific storage	3. L^2T^{-1}
D. Transmissivity	4. L^{-1}

Code :

	A	B	C	D
(a)	3	4	1	2
(b)	2	1	4	3
(c)	2	4	1	3
(d)	3	1	4	2

114. The average interstitial velocity of sand with effective porosity of 25% is equal to

(a) three times of the Darcy velocity

(b) four times of the Darcy velocity

(c) one-fourth of the Darcy velocity

(d) two and half times of the Darcy velocity

115. Which one of the following statements regarding Darcy's law is correct?

(a) Darcy velocity is proportional to square of the hydraulic gradient.

(b) Darcy velocity is proportional to square root of the hydraulic gradient.

(c) Darcy velocity is directly proportional to the hydraulic gradient.

(d) Darcy velocity is inversely proportional to the hydraulic gradient.

116. The Reynolds number (N_R) is expressed as

(a) N_R = Inertial force × Viscous force

(b) $N_R = \dfrac{\text{Inertial force}}{(\text{Viscous force})^2}$

(c) $N_R = \dfrac{\text{Viscous force}}{\text{Inertial force}}$

(d) $N_R = \dfrac{\text{Inertial force}}{\text{Viscous force}}$

117. Which one of the following is correct about Non-Carbonate Hardness (NCH)?

(a) NCH = Total hardness – Alkalinity

(b) NCH = Alkalinity – Total hardness

(c) NCH = Total hardness + Alkalinity

(d) $NCH = \frac{\text{Total hardness}}{\text{Alkalinity}}$

118. In application of the stable isotopes for groundwater study, the estimated relative fractionation is expressed as

(a) deviation in parts per ten thousand

(b) deviation in parts per hundred

(c) deviation in parts per ten

(d) deviation in parts per thousand

119. Which one of the following does ***not*** come under spreading methods of artificial recharge to groundwater?

(a) Basin method

(b) Stream-channel method

(c) Excess pumping method

(d) Ditch and furrow method

120. Which of the following statements regarding artificial recharge of the groundwater system is/are correct?

1. It neither maintains nor augments the groundwater resources.
2. It combats saline water intrusion in the coastal areas.
3. It combats adverse condition like progressive lowering of the ground-water level.

Select the correct answer using the code given below.

(a) 1 only

(b) 1 and 2

(c) 1 and 3

(d) 2 and 3

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