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Combined Geo-Scientist (Preliminary) Examination, 2026

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T.B.C. : BBSP-T-GHD

Test Booklet Series

Serial No.

0004265

TEST BOOKLET

Paper II

Geology/Hydrogeology

A

Time Allowed : Two Hours

Maximum Marks : 300

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    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to that question will be deducted as penalty.
    (ii) If a candidate gives more than one answer, it will be treated as **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
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1. The diametric opposite of Lyell's principle of uniformitarianism is

(a) Cycle of erosion

(b) Gradualism

(c) Catastrophism

(d) Steady-statism

2. Which one of the following statements related to Earth is **NOT** correct ?

(a) The core occupies about 16% of total Earth's volume

(b) The mantle occupies about 83% of total Earth's volume

(c) Average density of continental crust is 3·0 g/cm^3

(d) The mantle is largely composed of peridotite

3. The sinking flow of the top limb of the Hadley cells promotes

(a) Drying and warming of the air

(b) Evaporation of the oceanic water

(c) Katabatic winds

(d) Condensation of the moisture

4. The basis of calculation of Richter magnitude in earthquake is

(a) Distance from the focus

(b) Amplitude of the largest seismic wave

(c) Amount of ground shaking

(d) Severity of destruction

5. Consider there is no erosion, how much percentage of crust would be used to lower the Moho boundary because of isostasy, if the crust thickness is doubled ?

(a) 100%

(b) 80%

(c) 60%

(d) 50%

6. Which one of the following is **NOT** related to Andean-type mountain building ?

(a) Emplacement of Batholiths

(b) Development of Accretionary Wedge

(c) Gravitational collapse

(d) Building of Volcanic Arcs

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7. Consider the following statements regarding glaciers :

Statement – I : To the first order, at higher altitudes the mass balance always has a positive gradient with elevation

Statement – II : Where the mass balance is positive, it has snowed more than it melts in a year and vice versa

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

(a) Both the statements are individually true and Statement II is the correct explanation of Statement I

(b) Both the statements are individually true but Statement II is not the correct explanation of Statement I

(c) Statement I is true but Statement II is false

(d) Statement I is false but Statement II is true

8. Match List I with List II and select the correct answer using the code given below the lists :

List I *(Dune type)*	List II *(Form and position)*
A. Lee dune	1. Irregular accumulation rising up windward side of large topographic obstruction
B. Fore dune	2. Crescent-shaped opening upwind
C. Lunette	3. Elongated downwind from topographic obstruction
D. Climbing dune	4. Roughly arcuate with arms extending downwind either side of obstruction

Code :

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

9. Which one of the following landforms is commonly found at the base of waterfalls ?

(a) Potholes

(b) Plunge pools

(c) Rapids

(d) Arroyos

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10. Consider the following statements regarding fluvio-glacial deposition :

1. Meltwater can deposit sediment on, in, under and along the margins of glaciers

2. Eskers are sinuous, sometimes discontinuous, ridges formed of sand, gravel or boulders and range up to 200 m in height, 3 km in width and 100 km or more in length

3. Kame terraces are formed by the lateral or frontal accumulation of fluvio-glacial deposits along the ice margin

Which of the statement(s) given above is/are correct ?

(a) 1 and 2 only

(b) 1 only

(c) 2 and 3 only

(d) 1, 2 and 3

11. Which one of the following clay minerals has maximum expansion ?

(a) Kaolinite

(b) Illite

(c) Chlorite

(d) Montmorillonite

12. Match List I with List II and select the correct answer using the code given below the lists :

List I *(Product)*	List II *(Occurrence)*
A. Ferricrete	1. Humid to sub-humid tropical environments
B. Silcrete	
C. Gypcrete	2. Very arid regions
D. Calcrete	3. Semi-arid environment
	4. Humid and arid tropical environments

Code :

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

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13. Match List I with List II and select the correct answer using the code given below the lists :

List I (*Type of strength in rock*)	List II (*Characteristic*)
A. Yield Strength	1. Highest stress amount the rock experienced before rupturing
B. Ultimate Strength	2. Stress at which the rock ruptures
C. Fundamental Strength	3. Highest Stress which the rock is able to withstand regardless of time
D. Failure Strength	4. Stress above which permanent deformation occurs in the rocks

Code :

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

14. Consider the following statements regarding viscous materials :

1. Relative viscosity is related to competency which is resistance of layers or objects to flow
2. Viscous deformation implies dependence of stress on strain rate
3. Perfectly viscous materials are also known as Newtonian fluid

Which of the statement(s) given above is/are correct ?

(a) 1 and 2 only

(b) 1 only

(c) 2 and 3 only

(d) 1, 2 and 3

15. Match List I with List II and select the correct answer using the code given below the lists :

List I (*Type of linear fabric*)	List II (*Characteristic*)
A. Surface lineation	1. Linear structures on Earth's surface seen from satellite images
B. Mineral lineation	2. Numerous parallel hinges of milli-meter dimension folds
C. Rodding	3. Elongated mineral aggregates easily distinguishable from rest of the rock
D. Crenulation lineation	4. Penetrative parallel arrangement of elongate minerals in a rock
E. Lineament	5. Slickenlines

Code :

	A	B	C	D	E
(a)	1	5	2	3	4
(b)	2	3	4	1	5
(c)	5	2	4	3	1
(d)	5	4	3	2	1

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16. Consider the following statements regarding boudinage structure :

1. Boudinage structure always indicate layer parallel shortening
2. Boudins are more or less regularly shaped and spaced fragments of competent layers or foliation
3. Shape of the boudins reflects the viscosity contrast at the time of deformation
4. Rectangular boudins imply higher competence contrast and more brittle deformation than barrel-shaped ones

Which of the statements given above are correct ?

(a) 1, 2 and 3

(b) 2, 3 and 4

(c) 3 and 4 only

(d) 1 and 4

17. Consider the following statements regarding order of folds :

Statement – I : Parasitic folds are high-order folds

Statement – II : First-order folds are generally regional scale features

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

(a) Both statement I and statement II are true and statement II is the correct explanation of statement I

(b) Both statement I and statement II are true and statement II is not the correct explanation of statement I

(c) Statement I is true but statement II is false

(d) Statement I is false but statement II is true

18. Consider the following statements regarding fault ramps :

Statement – I : An individual fault surface generally is not a flat surface but may have ramps connecting different segments of the fault

Statement – II : If a fault is segmented but segments are not connected by a distinct ramp fracture, the structure is a step over

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

(a) Both statement I and statement II are true and statement II is the correct explanation of statement I

(b) Both statement I and statement II are true and statement II is not the correct explanation of statement I

(c) Statement I is true but statement II is false

(d) Statement I is false but statement II is true

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19. Diameter of Mohr circle for stress equals

(a) The maximum principal stress (σ_1)

(b) The intermediate principal stress (σ_2)

(c) The minimum principal stress (σ_3)

(d) The difference of maximum and minimum principal stresses ($\sigma_1 - \sigma_3$)

20. Consider the following statements regarding shear bands in S-C mylonite :

Statement – I : A set of shear bands commonly form parallel to the wall of main shear zone are the C-surfaces

Statement – II : C-surfaces are small scale shear zones that affect the foliation within the main shear zone

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

(a) Both statement I and statement II are true and statement II is the correct explanation of statement I

(b) Both statement I and statement II are true and statement II is not the correct explanation of statement I

(c) Statement I is true but statement II is false

(d) Statement I is false but statement II is true

21. Consider the following statements regarding mica fish structure :

Statement – I : Mica fish can be regarded as a type of S-C structure

Statement – II : Mica fish are commonly seen to be confined by shear bands

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

(a) Both statement I and statement II are true and statement II is the correct explanation of statement I

(b) Both statement I and statement II are true and statement II is not the correct explanation of statement I

(c) Statement I is true but statement II is false

(d) Statement I is false but statement II is true

22. Consider the following statements regarding V-rules of geological maps :

1. A plunging anticline whose axis plunges in the direction opposite to the slope of the valley floor will form a V upstream
2. If the axis of the anticline plunges in the same direction as the valley floor, the V points downstream, if the fold plunge is more than the valley slope
3. An asymmetric fold defines an asymmetric V in a valley
4. A unit defining a fold whose axis lies across the axis of a valley appears as two outcrop belts

Which of the statements given above are correct ?

(a) 1 and 2 only

(b) 1, 3 and 4 only

(c) 2, 3 and 4 only

(d) 1, 2, 3 and 4

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23. On a geological map closed outcrop patterns are bounded from all sides by thrusts. Which of the following interpretations of the outcrop patterns are correct ?

1. It may represent a nappe
2. It may represent a klippe
3. It may represent a tectonic window
4. It may represent a diapiric fold/ salt dome

Select the answer using the code given below :

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1, 2 and 3

(d) 1, 3 and 4

24. Which one of the following statements is **NOT** true for stereographic projection of the structural data ?

(a) The structural data are plotted on stereonet overlay as the lower half of projection sphere

(b) A plane is plotted as a line, and a line as a point on the stereonet

(c) A horizontal bed will be plotted as the large primitive circle and a dipping bed along the small circle girdle

(d) Anticline and syncline cannot be differentiated by plotting the dips of the fold limbs on the stereonet

25. The point group symmetry 6/m 2/m 2/m has symmetry content

(a) $i, 1A_6, 6A_2, 7m$

(b) $1A_6, 3A_2, 3m$

(c) $1, 1A_6, 1m$

(d) $6A_2, 6m, 3m$

26. The intercepts of a crystal face from the vortex in a hexagonal crystal is $1a_1$, ∞a_2, $(-)1a_3$, ∞c. The Miller-Bravais indices of the said face will be

(a) $(10\bar{1}0)$

(b) $(10\bar{1}1)$

(c) $(00\bar{1}1)$

(d) (1100)

27. Screw axes result from the simultaneous application of which one of the following symmetry operations ?

(a) Inversion and rotation

(b) Rotation and translation

(c) Translation and reflection

(d) Rotation and inversion

28. Monticellite belongs to which group of silicates ?

(a) Single chain silicate

(b) Nesosilicate

(c) Double chain silicate

(d) Tectosilicate

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29. Match List I with List II and select the correct answer using the code given below the lists :

List I (*Common structure type*)	List II (*Example of mineral*)
A. NaCl structure	1. Fluorite
B. TiO_2 structure	2. Chromite
C. AB_2O_4 structure	3. Sylvite
D. AX_2 structure	4. Pyrolusite

Code :

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

30. Consider the following statements regarding polymorphic reactions :

Statement – I : Some chemical compounds can exist in more than one structural or atomic arrangements with no change in their chemical composition

Statement – II : The reason why a constant chemical composition may have different structural arrangements is the tendency of a crystal structure to minimize its internal energy

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

(a) Both statement I and statement II are true and statement II is the correct explanation of statement I

(b) Both statement I and statement II are true and statement II is not the correct explanation of statement I

(c) Statement I is true but statement II is false

(d) Statement I is false but statement II is true

31. Consider the following statements regarding the miscibility gaps found within the plagioclase feldspar series :

1. The three regions have been named in increasing anorthite content (An), as the peristerite gap, the Bøggild intergrowth region, and the Huttenlocher intergrowth region
2. These regions represent exsolution phenomena on an extremely fine scale
3. Exsolution lamellae are responsible for the iridescence of plagioclase as a result of the presence of closely spaced lamellae of composition An_0 and An_{25} in the peristerite gap

Which of the statement(s) given above is/are correct ?

(a) 1 only

(b) 1 and 2 only

(c) 1, 2 and 3

(d) 2 and 3 only

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32. Which one among the following is **NOT** a 2 : 1 layer silicates ?

(a) Talc

(b) Kaolinite

(c) Phlogopite

(d) Vermiculite

33. A garnet has composition

$Fe^{2+}_{1.5}Mg_{0.9}Mn_{0.45}Ca_{0.15}Al_2Si_3O_{12}$. The mole percentages of grossular, almandine, spessartine and pyrope components in this garnet are

(a) 15, 10, 20 and 55% respectively

(b) 5, 50, 15 and 30% respectively

(c) 5, 15, 25 and 55% respectively

(d) 10, 20, 30 and 40% respectively

34. Consider the following "formalisms" in connection with color of minerals :

1. Crystal field theory
2. Molecular orbital theory
3. Band theory

Which of the formalism(s) given above account for color in minerals ?

(a) 1 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

35. Consider the following statements regarding alteration of olivine :

1. Serpentinization is the most widespread form of olivine alteration
2. The main alteration products of Mg-rich olivine are the three serpentine polymorphs : lizardite, chrysotile and antigorite together with brucite, talc and carbonates
3. Serpentinization may be expressed by the reaction

$$3Mg_2SiO_4 + 4H_2O + SiO_2 = 2Mg_3Si_2O_5(OH)_4$$

Which of the statement(s) given above is/are correct ?

(a) 1 only

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1, 2 and 3

36. Which one of the following pairs is **NOT** correctly matched ?

(a) Uniaxial positive : Quartz

(b) Biaxial positive : Hornblende

(c) Isotropic : Pyrope

(d) Biaxial negative : Biotite

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37. The formation of a dome-like structure (involving felsic magmas) related to density inversion is called

(a) Stock

(b) Diapirs

(c) Batholith

(d) Tongues

38. The evolution of a magma undergoing fractional crystallization depends upon which of the following factor(s) ?

1. Initial magma composition
2. Type of minerals crystallizing from the magma
3. Order of crystallization of minerals
4. Proportion of crystallizing minerals

Select the correct answer using the code given below :

(a) 4 only

(b) 1 and 2 only

(c) 1, 2 and 3 only

(d) 1, 2, 3 and 4

39. As per IUGS classification, which one of the following statements is correct ?

(a) Olivine-gabbro and troctolite contain equal amount of modal olivine

(b) Troctolite contains lesser amount of modal pyroxene than olivine-gabbro

(c) Troctolite contains much less modal olivine than olivine-gabbro

(d) Troctolite contains more than 95% of olivine

40. Development of traps is a common feature of flood basalt provinces. However, in rhyolite rocks, traps are not commonly developed. The most likely explanation for this is

(a) Rhyolite lavas are less polymerized

(b) Rhyolite lavas have silica percentage less than 45 wt.%

(c) Rhyolite lavas are extremely viscous

(d) Rhyolite lavas form in subduction zone

41. Which one of the following pairs is correctly matched ?

(a) Graphic texture : Basalt

(b) Spinifex texture : Komatiite

(c) Perthitic texture : Gabbro

(d) Amygdaloidal structure : Syenite

42. Which one of the following can be used to understand the stratigraphic top and bottom ?

(a) Dyke

(b) Sill

(c) Pillow lava

(d) Batholith

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43. Which one of the following phase diagrams has peritectic relation ?

(a) Diopside-albite

(b) Diopside-anorthite

(c) Albite-anorthite

(d) Forsterite-silica

44. The presence of sillimanite in a gabbro can be explained by the assimilation of

(a) Limestone

(b) Shale

(c) Quartzite

(d) Granite

45. With respect to the formation of a Layered Igneous Complex (LIC), which one of the following conditions is **NOT** suitable ?

(a) Maintenance of convection-current cells in the magma chamber

(b) Fast nucleation rate of crystals

(c) Broadly atectonic situation

(d) Oscillatory crystallization

46. The camptonite is a common alkaline lamprophyre and with decreasing silica activity it grades into

(a) Sannaites

(b) Monchiquite

(c) Fourchite

(d) Monzonite

47. What is the likely reason why most magnesium komatiites are generally restricted to the early Pre-cambrian ?

(a) Thermal regime necessary for high degree of melting may no longer exist

(b) No mantle plume formed after Pre-cambrian

(c) Subduction process did not operate before Pre-cambrian

(d) The density of komatiitic liquids increased after Pre-cambrian

48. Which one of the following statements regarding carbonatites is **NOT** correct ?

(a) They represent magmatically formed carbonate rocks

(b) They may host economic deposit of rare earth elements

(c) They are commonly found at Mid Oceanic Ridges

(d) They are associated with fenites

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49. Consider the following statements regarding metamorphic reactions :

1. Continuous metamorphic reactions take place over a range of temperatures as the compositions of the participating minerals change
2. Discontinuous metamorphic reactions occur when the compositions of the minerals are fixed by the appearance of another mineral
3. Tie-line flip reactions are a type of continuous metamorphic reaction

Which of the statement(s) given above is/are correct ?

(a) 1 and 2 only

(b) 1 only

(c) 2 and 3 only

(d) 1, 2 and 3

50. Consider the following statements regarding typical effects of rock metamorphism :

1. Minerals and mineral assemblages originally not present in a rock may form, the new mineral assemblages grow at the expense of old ones
2. The relative abundance of minerals in a rock may systematically change and the new rock may have a different modal composition
3. Metamorphic minerals will not undergo any systematic change in their composition

Which of the statement(s) given above is/are correct ?

(a) 1 only

(b) 2 only

(c) 1 and 2

(d) 1 and 3

51. Match List I with List II and select the correct answer using the code given below the lists :

List I *(Type of metamorphism)*	List II *(Typical metamorphic rock)*
A. Contact metamorphism	1. Blueschist, eclogite, serpentinite
B. Orogenic (subduction type)	2. Metabasalt, greenstone, metagabbro and serpentinite
C. Ocean-floor	3. Slate, phyllite, schist, gneiss, migmatite, greenschist, amphibolite, granulite
D. Orogenic (collision type)	4. Hornfels, skarn

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

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52. Which one of the following statements regarding gneissosity is **NOT** correct ?

(a) Gneissosity is a poorly developed planar fabric

(b) Gneissosity is defined by compositional layering

(c) Gneissosity is commonly formed by metamorphic segregation/process

(d) Gneissosity involves very fine grained minerals not visible to naked eye

53. Randomly oriented crystals that cut across an earlier foliation is a typical texture of

(a) Pre-kinematic crystals

(b) Post-kinematic crystals

(c) Syn-kinematic crystals

(d) Inter-kinematic crystals

54. Consider the following statements regarding development of 'pressure shadow' in a metamorphic rock :

1. Pressure shadows are areas of coarsely-recrystallized matrix material next to a porphyroblast

2. Pressure shadows develop in the region that was shielded from the maximum compressive stress during deformation by its proximity to the rigid porphyroblast

3. Material probably migrates here by pressure solution

Which of the statement(s) given above is/are correct ?

(a) 1 and 2 only

(b) 1 only

(c) 2 and 3 only

(d) 1, 2 and 3

55. An angular discordance between internal schistosity (S_i) and external schistosity (S_e) is best indication of

(a) Syn-tectonic porphyroblast growth

(b) Pre-tectonic porphyroblast growth

(c) Post-tectonic porphyroblast growth

(d) Porphyroblast growth unrelated to deformation

56. The complete set of Pressure-Temperature conditions that a rock now at the surface may have experienced during a metamorphic cycle from burial to metamorphism (orogeny) through uplift and erosion is called

(a) Pressure-Temperature path

(b) Pressure-Temperature-Time path

(c) Pressure-Time path

(d) Temperature-Time path

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57. Consider the following statements regarding cation-exchange metamorphic reactions :

1. This reaction type involves only a change in phase composition with no growth or dissolution of the phases themselves

2. It takes place in rocks with at least two minerals which are capable of cation-exchange with each other

3. Example of cation-exchange reaction is
cordierite + garnet → sillimanite + orthopyroxene

Which of the statement(s) given above is/are correct ?

(a) 1 and 2

(b) 1 only

(c) 2 and 3

(d) 1 and 3

58. In a three-component triangular ACF diagram proposed by Eskola (1915), the F pseudo-component calculated on a molecular basis is equal to

(a) FeO + MgO + MnO

(b) FeO

(c) MgO

(d) $FeO + Fe_2O_3$

59. Match List I with List II and select the correct answer using the code given below the lists :

List I *(Regional metamorphic facies)*	List II *(Characteristic mineral for mafic protolith)*
A. Blueschist	1. Hornblende
B. Eclogite	2. Omphacite
C. Granulite	3. Glaucophane
D. Amphibolite	4. Orthopyroxene

Code :

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

60. Which one among the following pairs is **NOT** correctly matched ?

(a) Franciscan facies series : High pressure, low temperature

(b) Buchan or Abukuma facies series : Medium pressure regional

(c) Contact facies series : Very low pressure

(d) Sanbagawa facies series : High pressure, moderate temperature

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61. In a scanning electron microscope photograph, the grain surfacial markings observed in beach sediments are

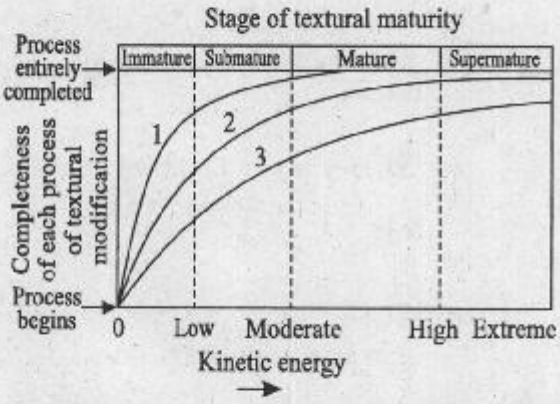
(a) U shaped pits

(b) Criss-cross pits

(c) V-shaped pits

(d) Squares and circles

62. In the given textural maturity diagram of sandstone, the curves 1, 2 and 3 represent trends of different textural parameters. Which one of the following represent the correct match of the parameters ?



(a) 1 = sorting of framework grains, 2 = rounding of framework grains, 3 = removal of clay

(b) 1 = rounding of framework grains, 2 = sorting of framework grains, 3 = removal of clay

(c) 1 = removal of clay, 2 = sorting of framework grains, 3 = rounding of framework grains

(d) 1 = removal of clay, 2 = rounding of framework grains, 3 = sorting of framework grains

63. Match List I with List II and select the correct answer using the code given below the lists :

List I *(Mass flow type)*	List II *(Type of fluid)*
A. Liquefied flow	1. Non-Newtonian fluid
B. Debris flow	2. Turbulent fluid
C. Grain Flow	3. Bingham plastic
D. Turbidity current	4. Newtonian fluid

Code :

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

64. Consider the following statements regarding Chevron Marks :

1. They are made up of continuous open V marks arranged to form a straight ridge
2. The V forms open in the down current direction
3. Consistency of mud plays an important role in the genesis of Chevron Marks

Which of the statement(s) given above is/are correct ?

(a) 1 only

(b) 1 and 2

(c) 2 and 3

(d) 1 and 3

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65. Which of the following statements regarding uses of trace fossils are correct ?

1. They serve as an indicator of relative sedimentation rate
2. They can indicate absolute age of sedimentary rocks
3. They can be used to mark any break in sedimentation
4. They can provide information about paleocurrent direction

Select the answer using the code given below :

(a) 1, 3 and 4

(b) 1, 2 and 3

(c) 1 and 2 only

(d) 2, 3 and 4

66. Consider the following statements regarding Hummocky cross-stratification :

1. It is characterized by undulating sets of cross-laminae
2. The sets are both concave-up and convex-up
3. The cross-bed sets cut gently into each other with curved erosional surfaces

Which of the statement(s) given above is/are correct ?

(a) 1 only

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1, 2 and 3

67. Which one of the following statements regarding 'Thrombolites' in carbonate rocks is **NOT** correct ?

(a) These are non-layered clotted fabrics formed by coccoid cyano-bacteria

(b) These are often constituted of patches of micrite separated by spar-filled spaces

(c) These grade through undifferentiated boundstone to form stromatolites

(d) These were primarily abundant during the Permian time

68. Which one of the following is the least possible mechanism to account for high abundance of matrix in quartz wacke ?

(a) Quartz sand blown into a quiet water environment

(b) Wash over deposit during a storm

(c) Vadose infiltration of clays into sands

(d) Diagenetic alteration of detrital feldspar and rock fragments

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69. Match List I with List II and select the correct answer using the code given below the lists :

List I *(Geomorphic feature)*	List II *(Sedimentary environment)*
A. Chenier plain	1. Glacier
B. Sabkha	2. Eolian
C. Ergs	3. Coastal mudflat with sand ridges
D. Kames	4. Supratidal

Code :

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

70. Remnant ocean basins are shrinking ocean basins caught between colliding continental margins and/or arc-trench systems. Modern day example of it is

(a) Persian Gulf

(b) Red Sea

(c) Santa Barbara basin

(d) Bay of Bengal basin

71. Which one of the following represents the correct order of the geomorphic subdivisions in an oceanic realm from shoreline to deep sea ?

(a) Inner shelf – Abyssal Plain – Continental rise – Continental slope

(b) Inner shelf – Shelf break – Continental slope – Continental rise

(c) Inner shelf – Shelf break – Continental rise – Continental slope

(d) Shelf break – Inner shelf – Continental slope – Abyssal plain

72. The neomorphic spar is characterized by :

1. Irregular or curved intercrystalline boundaries, commonly with embayments

2. Very regular crystal-size distribution and patchy development of coarse mosaic

3. Sharp, distinct boundaries to areas of neomorphic spar

4. Presence of skeletal grains floating in coarse spar

Select the correct answer using the code given below :

(a) 1 and 4

(b) 1 and 2

(c) 2 and 3

(d) 3 and 4

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73. The process of fossilization in which original pore spaces in the shell are impregnated with extra minerals is known as

(a) Replacement

(b) Permineralization

(c) Carbonization

(d) External mould

74. Match List I with List II and select the correct answer using the code given below the lists :

List I	List II
A. The homologous genes that may not necessarily be identical are known as	1. Allopatric population
B. A gene that suddenly and spontaneously changes to a new allele is known as	2. Alleles
C. Species separated by geographical barrier are referred as	3. Gene mutation
D. Species having same or overlapping geographical area are referred as	4. Sympatric population

Code :

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

75. Match List I with List II and select the correct answer using the code given below the lists :

List I *(Brachiopoda genus)*	List II *(Shape of valve)*
A. *Conchidium*	1. Dorsiconvex
B. *Atrypa*	2. Biconvex
C. *Hesperorthis*	3. Convexo-concave
D. *Dictyoclostus*	4. Plano-convex
E. *Herbertella*	5. Concavo-convex

Code :

	A	B	C	D	E
(a)	2	1	4	5	3
(b)	2	4	1	5	3
(c)	3	5	4	1	2
(d)	3	1	5	4	2

76. Which one among the following gastropods shell is characterized by the planispiral coiling ?

(a) *Natica*

(b) *Turritella*

(c) *Euomphalus*

(d) *Pleurotomaria*

77. The most primitive type of dentition in bivalves is

(a) Dysodont

(b) Isodont

(c) Taxodont

(d) Pachydont

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78. Consider the following statements regarding the suture morphology of ammonoids :

1. Inflection on the suture line pointing upward (towards aperture direction) are the saddles, whereas the backward pointing inflection (opposite to aperture) are the lobes

2. In ceratitic sutures, the saddles are crenulated though the lobes are entire

3. In ammonitic sutures, both saddles and lobes are crenulated

Which of the statement(s) given above is/are correct ?

(a) 1 and 2 only

(b) 2 only

(c) 1 and 3 only

(d) 1, 2 and 3

79. The extreme of all heteromorphs in ammonites showing very long tubular shell coiled in a series of U-bends into an unlikely tangle is known as

(a) *Choristoceras*

(b) *Lytocrioceras*

(c) *Nipponites*

(d) *Bochianites*

80. Which one among the following pairs is **NOT** correctly matched ?

(a) *Eohippus* : Dawn horse

(b) *Orohippus* : Mountain horse

(c) *Equus* : Modern horse

(d) *Mesohippus* : Miocene

81. Which one among the following pairs is **NOT** correctly matched ?

(a) *Homo neanderthalensis* : Late Pleistocene

(b) *Gigantopithecus* : Late Miocene

(c) *Sivapithecus* : Middle Miocene

(d) *Kenyapithecus* : Pliocene

82. The larger benthic foraminifera are major contributors to modern carbonate sedimentation, in modern tropical oligotrophic setting they can produce

(a) 400 g $CaCO_3/m^2$ every year

(b) 2000 g $CaCO_3/m^2$ every year

(c) 2800 g $CaCO_3/m^2$ every year

(d) 3200 g $CaCO_3/m^2$ every year

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83. Consider the following statements :

Statement – I : Larger benthic foraminifera are typically larger than 2 mm in diameter and 3 mm^3 in volume and have complex internal structures which are useful for biostratigraphy of Tethyan sediment

Statement –II : As the developmental stages of foraminiferid life history are preserved in the test, they are well suited to evolutionary studies

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

(a) Both the statements are individually true and Statement II is the correct explanation of Statement I

(b) Both the statements are individually true but Statement II is not the correct explanation of Statement I

(c) Statement I is true but Statement II is false

(d) Statement I is false but Statement II is true

84. Which one of the following is **NOT** a Lower Gondwana plant fossil ?

(a) *Schizoneura*

(b) *Gangamopteris*

(c) *Brachyphyllum*

(d) *Phyllotheca*

85. Biozone, the basic unit of biostratigraphic classification is characterized by

(a) Characteristic fossil or assemblage of fossils

(b) Characteristic lithology

(c) Specific interval of time

(d) Specific depositional environment

86. A location where the lithological characteristics of the formation are clear and, if possible, where the lower and upper boundaries of formation can be seen is called

(a) Auxiliary section

(b) Type section

(c) Lithodeme

(d) Suite

87. Match the commonly used elements in geochronology (List-I) with rock types wherein these elements are preferably used (List-II) and select the correct answer using the code given below the lists :

List I *(Element)*	List II *(Rock type)*
A. ^{238}U	1. Rocks younger than 50,000 years
B. ^{14}C	2. Rocks with alkali feldspar and mica
C. ^{87}Rb	3. Zircon bearing rocks
D. ^{147}Sm	4. Basic rocks

Code :

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

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88. The Peninsular Gneiss is typically made up of which one of the following ?

(a) Quartzites and conglomerates

(b) Migmatitic gneisses alternating with bands of amphibolite and tonalites

(c) Metamorphosed ultra-basic rocks interlayered with carbonates and argillaceous sediments

(d) Charnockites and Khondalites

89. Which one of the following is the northernmost craton of the Indian Shield concealed under the Indo-Gangetic Alluvium extending in the north up to the Himalaya and bounded by Son-Narmada fault against the Satpura Mobile Belt in the south and by the Great Boundary fault against the Aravalli Craton in the west ?

(a) Mewar Craton

(b) Dharwar Craton

(c) Singhbhum Craton

(d) Bundelkhand Craton

90. The Dharwar Craton is a classic greenstone-granite terrain. It is divided into Western and Eastern Dharwar Cratons. These two divisions are separated from each other by which one of the following ?

(a) Closepet Granite close to Chitradurga Shear Zone

(b) Peninsular Gneiss

(c) Palghat-Cauvery Shear Zone

(d) Karur-Kambam Shear Zone

91. Which one of the following is the oldest volcanic formation in India ?

(a) Deccan Traps

(b) Panjal Traps

(c) Rajmahal Traps

(d) Dhanjori Volcanics

92. Which one of the following litho-unit of the Cuddapah Supergroup has diamond bearing horizon ?

(a) Narji Limestone

(b) Banganapalle Formation

(c) Tadpatri Formation

(d) Vempalle Formation

93. The only carbonate litho-unit present within upper Vindhyan is

(a) Kajrahat Limestone

(b) Rohtas Limestone

(c) Bhander Limestone

(d) Koilkuntla Limestone

94. The geological record of Late Cretaceous transgression in the Narmada valley is present in

(a) Trichinopoly Group

(b) Kallamedu Formation

(c) Bagh Group

(d) Chikkim Formation

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95. Marine intercalations in the basal part of Gondwana succession belongs to

(a) Late Jurassic age

(b) Late Triassic age

(c) Early Permian age

(d) Early Cretaceous age

96. Which one of the following lithostratigraphic unit represents deposition by glaciers ?

(a) Barakar Formation

(b) Talchir Formation

(c) Karharbari Formation

(d) Kulti Formation

97. Chromite deposits of Bushveld Complex, South Africa and Great dyke of Zimbabwe are the examples of

(a) Stratiform deposits

(b) Podiform deposits

(c) SEDEX deposits

(d) VMS deposits

98. The process by which a new phase unmixes from a solid solution when it is cooled to a temperature below its solvus is known as

(a) Annealing

(b) Exsolution

(c) Replacement

(d) Deformation

99. Porphyry Cu-Mo deposits are associated with calc-alkaline or I-type magmas generated adjacent to

(a) Mid-oceanic ridges

(b) Subduction zones

(c) Continental rifts

(d) Oceanic islands

100. The Olympic Dam deposit of South Australia is an example of

(a) VMS deposit

(b) Unconformity-type deposit

(c) IOCG deposit

(d) SEDEX deposit

101. Match List I with List II and select the correct answer using the code given below the lists :

List I *(Zone)*	List II *(Mineral)*
A. Primary ore	1. Azurite
B. Oxidized ore	2. Covellite
C. Secondary sulfide enrichment	3. Chalcopyrite
D. Gossan capping	4. Limonite

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

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102. Consider the following statements regarding Banded Iron-Formation (BIF) :

Statement – 1 : Algoma type BIFs are associated with volcanic rocks and are typically found in Archaean greenstone belts

Statement – 2 : Superior type BIFs were deposited on continental platforms mainly during Palaeo-proterozoic

Which of the statement(s) given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

103. Consider the following statements regarding ore deposits formed in sedimentary environments :

1. Ironstones are the iron rich sedimentary rocks with more than 15 wt % FeO
2. Manganese deposits are manganese oxide or carbonate-rich sedimentary rocks and are the world's major source of Mn

Which of the statement(s) given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

104. In a supergene ore, presence of malachite, azurite and chrysocolla indicates

(a) Zone of oxidation

(b) Zone of Secondary enrichment

(c) Primary ore zone

(d) Leached capping zone

105. Consider the following statements regarding types of coal seams :

1. Concordant seams occur over large areas intercalated with strata of host sediments of the same age
2. Discordant seams typically occur above a stratigraphical unconformity and constitute the base of transgressive sediments

Which of the statement(s) given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

106. Coal that breaks with a splintery or conchoidal fracture, is lusterless, contains wind-blown spores and pollens and burns with a long flame is

(a) Boghead coal

(b) Cannel coal

(c) Anthracite

(d) Lignite

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107. Which one of the following coal/lignite fields does **NOT** belong to Gondwana period ?

(a) Damodar valley

(b) Mahanadi valley

(c) Neyveli

(d) Wardha valley

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

List I *(Locality)*	List II *(Deposit)*
A. Singrauli	1. Lead-zinc
B. Ingaldhal	2. Iron
C. Dalli-Rajhara	3. Copper
D. Sargipalli	4. Coal

Code :

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

109. Consider the following statements regarding subsurface water :

1. The thickness of the capillary zone vary inversely with the pore size of soil or rock

2. Expected capillary rise of water in silt is less than that of sand; with assumption that both formation have same porosity

Which of the statement(s) given above is/are correct ?

(a) Both 1 and 2

(b) 1 only

(c) 2 only

(d) Neither 1 nor 2

110. In an area of 300 hectares (ha), the water table dropped by 5 m. If the porosity is 40% and the specific retention is 20%, what is the change in groundwater storage volume ?

(a) 1500 ha.m

(b) 900 ha.m

(c) 600 ha.m

(d) 300 ha.m

111. A confined aquifer has hydraulic conductivity value of 30 m/day. What is its transmissivity if the saturated thickness of the aquifer is 6 m ?

(a) 5 m^2/day

(b) 5400 m^3/day

(c) 180 m^2/day

(d) 1080 m^3/day

112. How much water can be produced by lowering the water table of an un-confined aquifer by 4 meters over an area of one square kilometre ? (aquifer porosity = 0·4 and specific retention = 0·15)

(a) 10^4 m^3

(b) 10^5 m^3

(c) 10^6 m^3

(d) 10^7 m^3

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113. What will be the porosity of the rock, if it has void ratio of 0·25 ?

(a) 75%

(b) 50%

(c) 25%

(d) 20%

114. Which one of the following statements regarding porosity of sedimentary deposits is **NOT** correct ?

(a) Porosity depends on the shape and arrangement of individual particles/grains

(b) Porosity depends on the degree of cementation and compaction

(c) Porosity increases with depth of burial in sedimentary rocks subject to compaction

(d) Well sorted sedimentary deposits have higher porosity than poorly sorted sedimentary deposits

115. An aquifer has effective porosity (α) of 25%. Which one of the following is the correct relationship between average interstitial/linear velocity (V_α) and Darcy velocity (v) ?

(a) $V_\alpha = 0{\cdot}25v$

(b) $V_\alpha = 4v$

(c) $V_\alpha = 2{\cdot}5v$

(d) $V_\alpha = v$

116. Which one of the following statements regarding Darcy's law is **NOT** correct ?

(a) Specific discharge is equal to product of hydraulic conductivity and hydraulic gradient

(b) Specific discharge is equal to the rate of flow of water through unit cross-sectional area of the medium, perpendicular to direction of groundwater flow

(c) Specific discharge is equal to average interstitial/linear velocity

(d) Specific discharge is proportional to the hydraulic gradient

117. Which of the following statements regarding Reynolds number are correct ?

1. Reynolds number depends on fluid density
2. Reynolds number is independent of velocity of the fluid
3. Reynolds number depends on diameter of pipe or conduit
4. Reynolds number is independent of the dynamic viscosity of the fluid

Select the answer using the code given below :

(a) 1 and 2 only

(b) 1, 2 and 3

(c) 1 and 3 only

(d) 2 and 4

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118. Which one of the following isotopes is used to estimate the age of ground-water ?

(a) Tritium (^3H)

(b) Deuterium (^2H)

(c) ^{16}O

(d) ^{18}O

119. Consider the following statements regarding Ditch and Furrow method for artificial recharge of groundwater :

1. In the Ditch and Furrow method, water is distributed to a series of ditches or furrows
2. The ditches and furrows are shallow, flat bottomed and closely spaced

Which of the statement(s) given above is/are correct ?

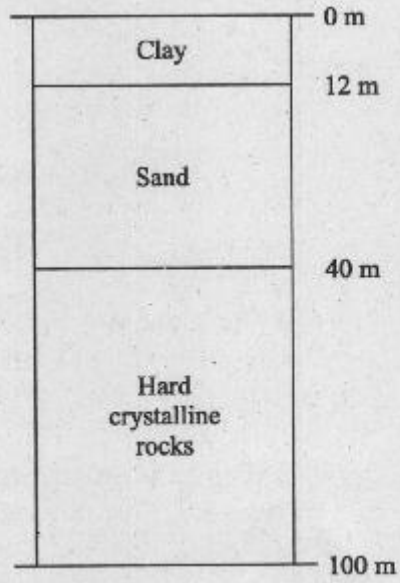
(a) 1 only

(b) 2 only

(c) Neither 1 nor 2

(d) Both 1 and 2

120. The lithologic succession of an area as obtained from a borehole is given in the accompanying figure. A pit is required to be excavated for artificial recharge of groundwater. What should be the minimum depth of recharge pit ?



(a) 12 m

(b) 40 m

(c) 52 m

(d) 100 m

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