

Answer sheet of Paper II(Geology)

CGSE-2024

Preliminary
Examination

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PAPER-II Provisional Answer Keys (Question Set-A)

1.	B
2.	A
3.	C
4.	B
5.	D
6.	A
7.	D
8.	C
9.	B
10.	B
11.	A
12.	B
13.	B
14.	A
15.	C
16.	A
17.	D
18.	A
19.	D
20.	B
21.	B
22.	B
23.	B
24.	B
25.	B
26.	B
27.	D
28.	B
29.	B
30.	A
31.	D
32.	B
33.	D
34.	B
35.	D
36.	D
37.	B
38.	A
39.	B
40.	D

41.	A
42.	C
43.	D
44.	D
45.	B
46.	D
47.	C
48.	C
49.	A
50.	D
51.	C
52.	C
53.	B
54.	A
55.	B
56.	D
57.	A
58.	A
59.	A
60.	A
61.	C
62.	A
63.	C
64.	B
65.	B
66.	D
67.	C
68.	B
69.	A
70.	A
71.	A
72.	D
73.	A
74.	C
75.	A
76.	B
77.	A
78.	A
79.	B
80.	C

81.	A
82.	B
83.	C
84.	B
85.	D
86.	A
87.	D
88.	B
89.	A
90.	D
91.	A
92.	D
93.	C
94.	A
95.	C
96.	A
97.	D
98.	C
99.	C
100.	D
101.	C
102.	B
103.	B
104.	B
105.	A
106.	B
107.	D
108.	C
109.	C
110.	B
111.	C
112.	C
113.	B
114.	D
115.	A & D
116.	D
117.	C
118.	A
119.	C
120.	B

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1. The idea, that many of the features of the landscape were to be explained by rapidly occurring events, is given by the principle of:
 - a. Uniformitarianism
 - b. Catastrophism**
 - c. Unconformities
 - d. Gradualism

Description: In geology, catastrophism is the theory that the Earth has largely been shaped by sudden, short-lived, violent events, possibly worldwide in scope. This contrasts with uniformitarianism (sometimes called gradualism)

2. The inclusions in meteorites considered to be droplets that have condensed from the original solar nebula from which the solar system derives, are known as :
 - a. **Chondrules.**
 - b. Chondrites
 - c. Achondrite
 - d. Euerite

Description: A chondrule is a round grain found in a chondrite. Chondrules form as molten or partially molten droplets in space before being accreted to their parent asteroids. Because chondrites represent one of the oldest solid materials within the Solar System and are believed to be the building blocks of the planetary system, it follows that an understanding of the formation of chondrules is important to understand the initial development of the planetary system

3. What is the average albedo of whole Earth?
 - a. 0-6
 - b. 0.1
 - c. 0-3**
 - d. 0.7
4. Match List-I with List-II and select the correct answer using the code given below the lists:

List. I		List-II	
(Type of magma/lava external form)		(Volcanic features)	
P. Pahoehoe lava flow		1. Explosive eruption	
Q. Aa lava flow		2. Smooth surface	
R. Mafic magma		3. Quiet eruption	
S. Felsic magma		4. Form blocks and rough surface	

	P	Q	R	S
a	1	4	3	2
b	2	4	3	1
c	1	3	4	2
d	2	3	4	1

5. In some cases, the sediments on the down going plate are added to the accretionary prism when the basal thrust of the prism propagates into the downgoing sediments, forming a duplex structure and adding the sediments to the bottom of the accretionary prism. This process is called:
- Obduction
 - Subduction
 - Underplating
 - d. Accretion**

Description: Accretion means the process of growth or enlargement by a gradual buildup. For example, gravity can cause small bits of matter to stick to an object and make it bigger.

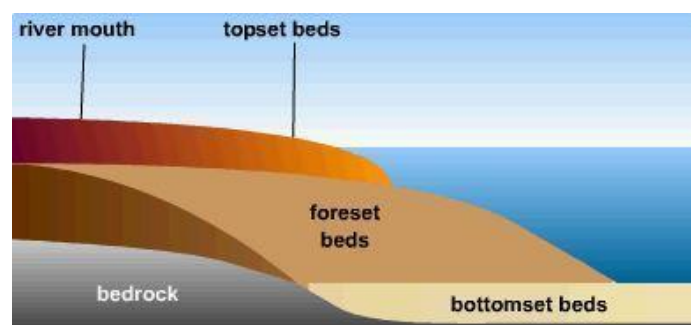
Accretion describes the process by which fragments of tectonic plates are added to the continent at a plate tectonic boundary. This can happen at a subduction zone, where material is scraped off of the downgoing plate and added onto the overriding plate

Obduction, which is less common, normally occurs in plate collisions at orogenic belts (some of the material from the subducting oceanic plate is emplaced onto the continental plate) or back-arc basins (regions where the edge of a continent is pulled away from the rest of the continent due to the stress of plate collision)

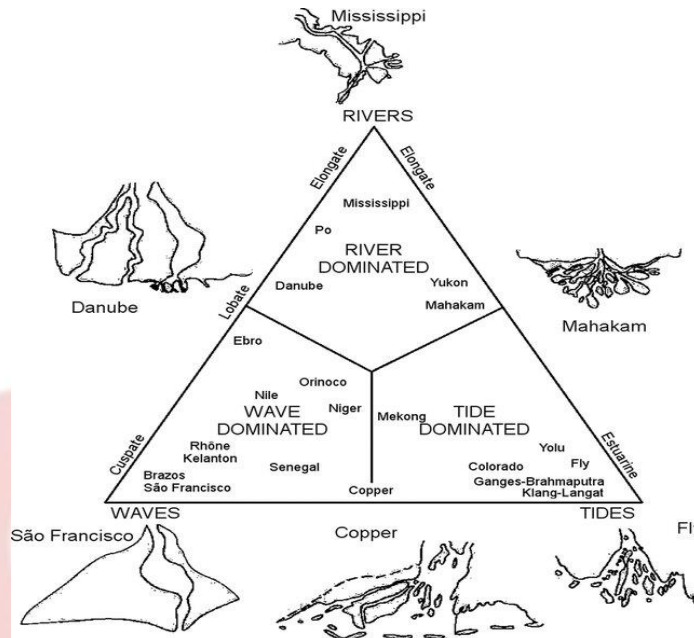
6. Widespread asymmetrical bulges along continental edges that fall directly into the sea with steeper slope towards the coast are called:
- a. Great escarpment**
 - Marginal swells
 - Fall line
 - Outlying plateau

Description: The Great Escarpment is a major topographical feature in Africa that consists of steep slopes from the high central Southern African plateau[1] downward in the direction of the oceans that surround southern Africa on three sides

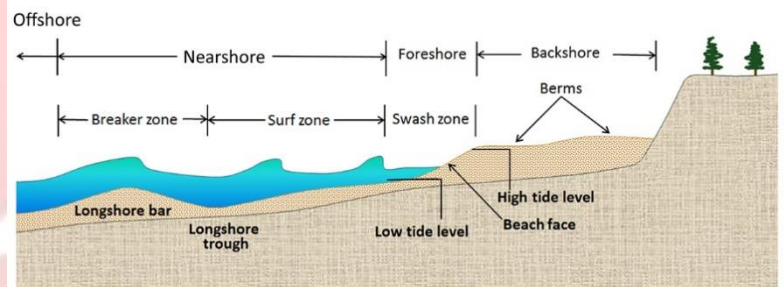
7. Glacial drift represents:
- Glacial sediments transported from accumulation zone
 - Coarse grained sediments transported by glacier
 - Sediment eroded by glaciers and transported by meltwater
 - d. All types of glaciers transported sediments**
8. In a delta, the thick layer consisting of coarse particles that drop soon after entering the water body is called:
- Foreset layer
 - Bottomset layer
 - c. Topset layer**
 - None of the above



9. Which one of the following is not correctly matched?
- Mississippi River delta: River-dominated delta
 - Ganges-Brahmaputra delta: River-dominated delta**
 - Nile River delta: Wave-dominated delta
 - Fly River delta: Tide-dominated delta



10. A nearly horizontal or landward sloping bench developed due to deposition of sediments by ocean waves is called:
- Wave-cut bench
 - Berm**
 - Beach
 - Marine platform



11. Kaolinite is generally a weathering product of which one of the following minerals?
- Feldspar**
 - Muscovite
 - Biotite
 - Carbonates
12. Consider the following statements regarding soil formation:
- Similar soils can develop from different parent materials.
 - Time is not an important component
 - Climate is more important than other factors in formation of soils.

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

- 1 and 2
- 1 and 3**
- 2 and 3
- 2 only

Description: Soils are formed by the weathering of rocks or materials deposited by rivers or wind. There are five groups of factors responsible for the kind, rate and extent of soil development. They are: Climate, organisms, parent material, topography and time **The influence of climate is due to basically two factors:** temperature and rainfall. Climate indirectly affects soil formation through its influence on organisms as well. High temperatures and rainfall increase the degree of weathering and therefore the extent of soil development.

Increase of rainfall increase organic matter content, decrease pH, increase leaching of basic ions, movement of clay etc. Increase temperature increase organic matter decomposition and decrease its accumulation

13. Poisson's ratio is:

- a. Axial strain / Transverse strain
- b. Transverse strain / Axial strain**
- c. Elastic strain / Shear strain
- d. Shear strain / Linear strain

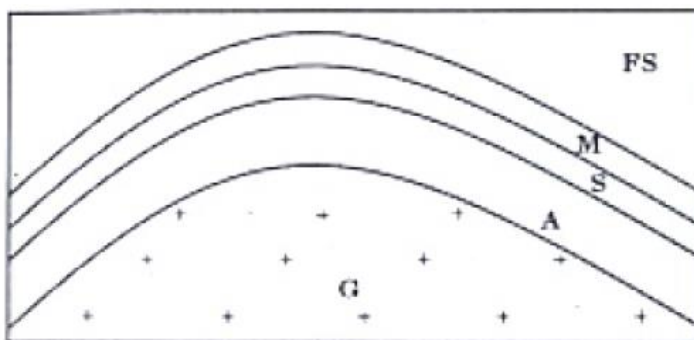
14. The difference between the total stress and the mean stress of a geological system is called:

- a. Deviatoric stress**
- b. Hydrostatic stress
- c. Differential stress
- d. Normal stress

Deviatoric stress is the difference between the applied stress and the average stress in a material

The difference between the largest and smallest stress is called differential stress.

15. Consider the following geological section of a folded terrain and the corresponding statements:



Codes : G-Archean Granite,
A-Cambrian Arkose,
S-Cambrian Shale,
M-Miocene Mudstone,
FS-Fine Sandstone

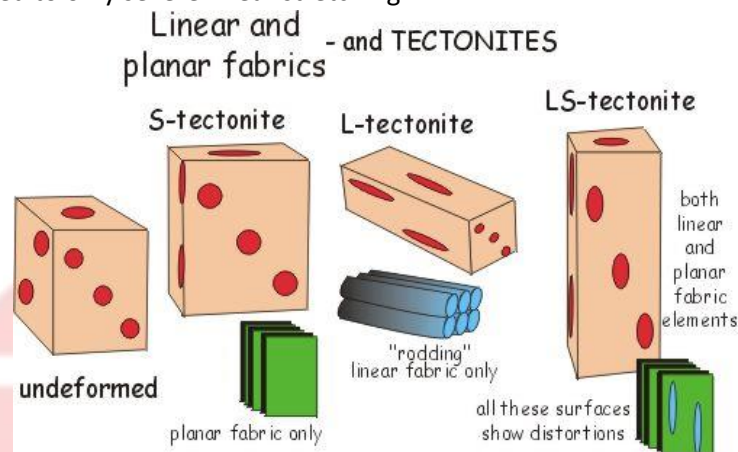
- 1) The rock sequences contain a disconformity.
- 2) The rock sequences contain a nonconformity.
- 3) Unconformity formed prior to folding.
- 4) Granite body got emplaced in the core of anticlinal fold.

Which of the statements given above are correct?

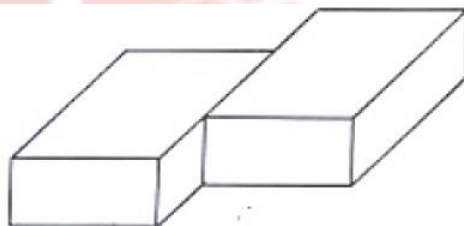
- a. 1 and 4 only
- b. 2 and 3 only
- c. 1, 2 and 3 only**
- d. 1, 2, 3 and 4

16. The L-S tectonite is:

- A strongly deformed rock dominated by both linear and planar fabric elements
- A rock subjected to listric faulting
- A rock produced by intense crushing
- A rock subjected to only severe linear stretching



17. Consider the following diagram of fault and the corresponding statements:



- The hanging wall has moved neither up nor down, but displaced horizontally relative to the foot wall in the fault.
- The fault is a strike fault.
- The fault is a left-handed strike-slip fault.
- The slickenside lineation formed due to faulting is expected to be horizontal.

Which of the statements given above are correct?

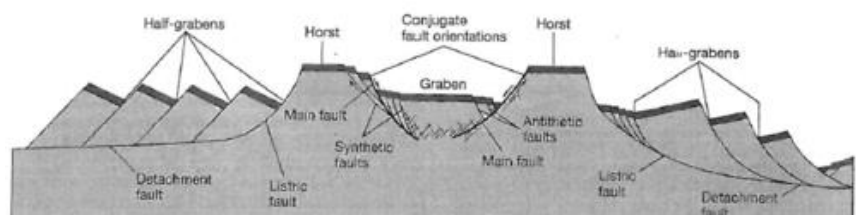
- 1 and 2
- 1 and 3
- 2 and 3
- 3 and 4**

18. Consider the following statements:

- An antithetic fault dips towards the master fault.
- An antithetic fault dips in the same direction as the master fault.
- A synthetic fault dips towards the master fault.
- A synthetic fault dips in the same direction as the master fault.

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

- 1 and 4**
- 2 and 3
- 1 only
- 2 only



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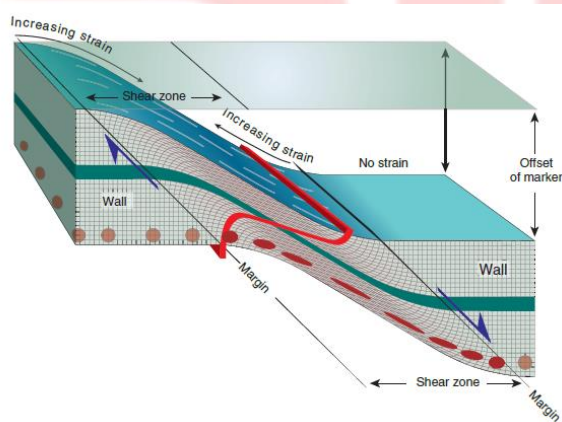
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19. The angle of internal friction (ϕ) of a rock is 28. According to the Coulomb failure criterion, the acute angle between two conjugate shear fracture planes formed in the rock should ideally be :
- 28°
 - 58°
 - 60°
 - 62**

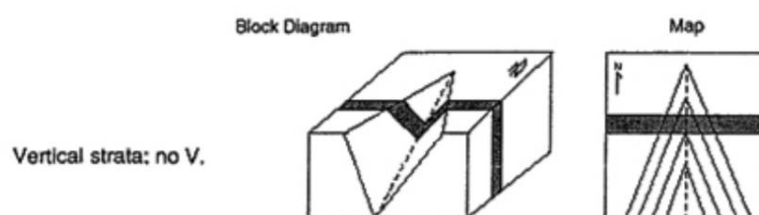
20. Consider the following statements regarding homogeneous deformation due to shearing:
- 1) Straight lines remain straight after deformation.
 - 2) Straight lines become curved after deformation.
 - 3) Parallel lines remain parallel after deformation.
 - 4) Parallel lines lose their parallelism after deformation.

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

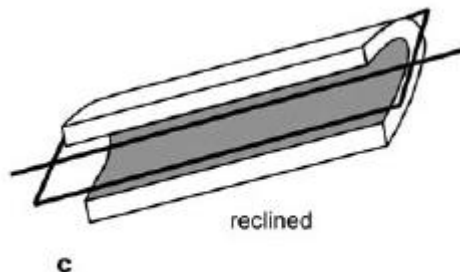
- 1 only
 - 1 and 3**
 - 2 and 3
 - 1 and 4
21. The section of a mylonite on which the asymmetric shear-sense indicators are best observed and analysed is:
- Parallel to the mylonitic foliation and perpendicular to the aggregate lineation
 - Perpendicular to the mylonite foliation and parallel to the aggregate lineation**
 - Parallel to the mylonitic foliation and parallel to the stretching lineation
 - Perpendicular to the mylonitic foliation and perpendicular to the stretching lineation



22. In a river valley a dipping bed shows a straight linear outcrop across the river on the geological map. The bed is:
- Folded
 - Vertical**
 - Dipping at an angle less than valley slope in downstream direction
 - Dipping at an angle more than valley slope in upstream direction



23. regarding the outcrop pattern of a reclined fold is correct ?
- The fold axis trends nearly at 45° to the axial trace of the fold.
 - The fold axis plunges towards the concave side of the fold outcrop.**
 - The fold axis trends nearly at a right angle to the axial trace of the fold.
 - The outcrop pattern of the fold is closed with an eye-shaped geometry.



24. A limestone bed strikes $N30^\circ E$ and dips 70° towards SE. What should be the expected dip of the bed if it is seen on a E-W road section?
- 8° towards east
 - 67° towards east**
 - 78° towards west
 - 46° towards west
25. If in a crystal the glide component is represented by $a/2+b/2$, $a/2+c/2$, $b/2+c/2$ or $a/2+b/2+c/2$ then the glide plane is
- a glide
 - Diagonal glide**
 - Diamond glide
 - Glide

Description: Axial glides are planes whose glide component is parallel to a crystallographic axis and equal in length to one-half the repeat unit along this axis. Such axial glides are symbolized as a, b, or c according to whether their glide component was along the a, b, or c axis and was equal to, respectively, $a/2$, $b/2$, or $c/2$, where a, b, and c represent the lattice vectors or unit cell edges.

Diagonal glides, whose general symbol is n, are glide planes whose glide component represents the vector sum of any two of the following vectors: **$a/2$, $b/2$, $c/2$.**

For **diamond glides**, which are so named because they occur in the structure of diamond, the general symbol is d and their glide component represents the vector sum of any two of the following: **$a/4$, $b/4$, $c/4$.**

26. An open crystal form composed of 3, 4, 6, 8 or 12 faces, all of which are parallel to the same axis, is called as _____
- Pyramid
 - Prism**
 - Pinacoid
 - Sphenoid

27. Which one among the following pairs is not correctly matched?

- a. Pyrope : $Mg_3Al_2Si_3O_{12}$
- b. Almandine: $Fe_3Al_2Si_3O_{12}$
- c. Spessartite : $Mn_3Al_2Si_3O_{12}$
- d. **Uvarovite : $Ca_3Al_2Si_3O_{12}$**

28. Consider the following statements:

Statement 1: The relative importance of crystal forms is proportional to the point densities or spacings of the respective lattice planes.

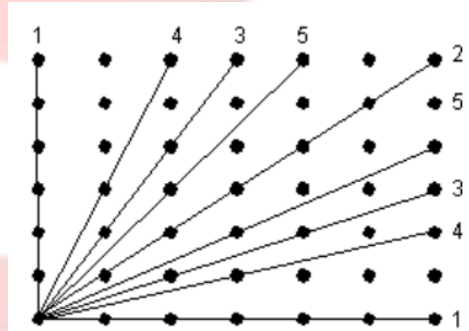
Statement 2: The rate of crystal growth in any lattice direction is proportional to the point density in that direction.

The above statements belong to which rule/law?

- a. Pauling's Rules
- b. **Bravais Law**
- c. Bragg's Law
- d. Stokes' Law

Description: Crystal faces develop along planes defined by the points in the lattice. In other words, all crystal faces must intersect atoms or molecules that make up the points. A face is more commonly developed in a crystal if it intersects a larger number of lattice points. This is known as the Bravais Law.

For example, in the plane lattice shown at the right, faces will be more common if they develop along the lattice planes labelled 1, somewhat common if they develop along those labelled 2, and less and less common if they develop along planes labelled 3, 4, and 5



29. Spinel group is an example of:

- a. Polymorphism
- b. **Isomorphism**
- c. Pseudomorphism
- d. Paramorphism

30. Consider the following statements regarding polymorphism:

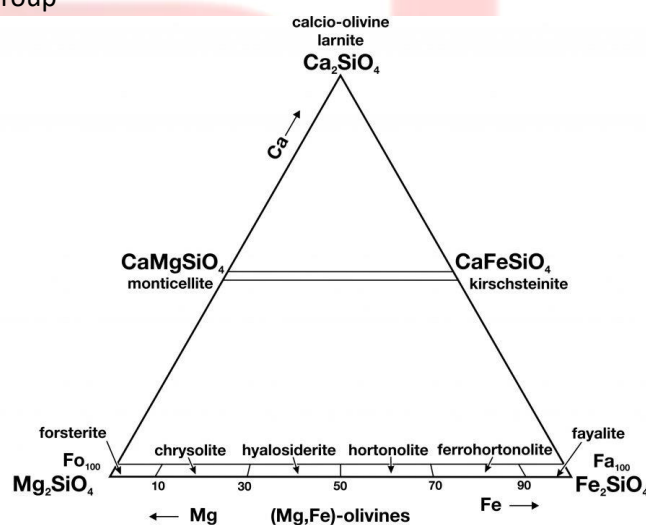
Statement 1 : Polytypism is a variety of polymorphism.

Statement 2: It involves stacking of identical layers in different sequences within a structure which have same unit cell lengths in two dimensions but commonly have a different cell length in the third dimension, which is essentially perpendicular to the layers.

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

- a. **Both statement 1 and statement 2 are true and statement 2 is the correct explanation of statement 1.**
- b. Both statement 1 and statement 2 are true, but statement 2 is not the correct explanation of statement 1.
- c. Statement 1 is true, but statement 2 is false.
- d. Statement 1 is false, but statement 2 is true.

31. In a temperature-composition diagram of two components of A and B (involving no solid solution between A and B); liquid +A + B will exist:
- Above liquidus
 - Between liquidus and solidus
 - Below solidus
 - At eutectic point**
32. Regarding the structure of silicates, the type $(Si_2O_7)^{-6}$ is known as :
- Cyclosilicate
 - Sorosilicate**
 - Phyllosilicate
 - Tectosilicate
33. What is the mechanism of solid solution, if Pb^{2+} substitutes for K^+ in microcline?
- Simple substitution
 - Interstitial solid solution
 - Omission solid solution
 - Coupled substitution**
34. Monticellite is Ca-bearing end member of which one of the following mineral groups?
- Pyroxene Group
 - Olivine Group**
 - Garnet Group
 - Epidote Group



35. Which one of the following statements is not correct?
- The optic axial angle of olivine group minerals varies from $2V_y 82^\circ$ for Mg_2SiO_4 and 134° for Fe_2SiO_4 .
 - Magnesium-rich olivine is distinguished from diopside by its poor cleavage, large optic axial angle and higher birefringence.
 - Iron-rich olivine's occur in both alkaline and acid plutonic and hypabyssal rocks.
 - Olivine's of nearly equal Fe-Mg are common constituents of Komatiite.**

Description: Refer to Page no 10 11 and 12 from An introduction to rock forming mineral By Zussaman

36. Which one of the following minerals does not belong to pyroxene group
- Omphacite $(Ca,Na)(Mg,Fe,Al)[Si_2O_6]$
 - Kosmochlor $(NaCr^{3+}Si_2O_6)$
 - Pigeonite $((Ca,Mg,Fe)(Mg,Fe)Si_2O_6)$
 - Eckermannite (Na-Amphibole) $Na_3Mg_4Al(Si_8O_{22})(OH)_2$**
37. Which one of the following statements in relation to CO_2 with silicate melts is correct?
- CO_2 has lower solubility in melts with low polymerization.
 - CO_2 has higher solubility in melts with low polymerization.**
 - CO_2 has higher solubility in melts with high polymerization.
 - CO_2 has lower solubility in melts with high polymerization.

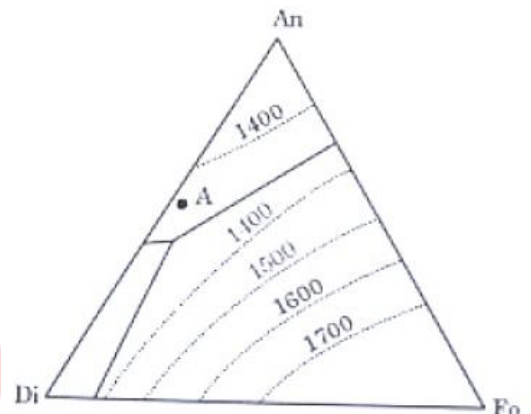
Description: CO_2 tends to make a more polymerized melt, whereas H_2O breaks the bridging bonds. CO_2 should thus dissolve to a greater extent in more mafic, less polymerized melts, and it should raise the viscosity of those melts as it dissolves. This also explains why CO_2 dissolves to a greater extent if H_2O is present because H_2O creates less polymerized melts, which, in turn, attract CO_2 .

38. The best-known synthetic analogy of mantle composition is:
- Pyrolite**
 - Spinel lherzolite
 - Garnet lherzolite
 - Peridotite
39. Ultramafic rock containing model values of Olivine (50%), Orthopyroxene (30%), Clinopyroxene (12%) and Spinel (8%) is classified under which one of the following?
- Websterite
 - Lherzolite**
 - Harzburgite
 - Troctolite
40. Stocks and batholiths are primarily distinguished on the basis of :
- Shape
 - Depth of emplacement
 - Mineralogical composition
 - Areal extent**
41. The texture in which exsolution lamellae of k-feldspar that occurs in albite host is called
- Antiperthite**
 - Perthite
 - Ocelli
 - Graphic intergrowth
42. A porphyritic basalt contains phenocrysts of glassy groundmass, which one of the following statements on the petrogenesis of the basalt is correct?
- Both plagioclase and groundmass crystallized at the deeper level of the crust.
 - Both plagioclase and groundmass formed during eruption of the basalt.
 - Plagioclase crystallized at deeper level of the crust, while the groundmass solidified at shallower depth.**
 - Plagioclase crystallized at shallower depth during eruption of the basalt, while the groundmass solidified at deeper level of the crust.

43. Consider the following phase diagram?

What will be the correct sequence of appearance of the minerals for the equilibrium crystallization of magma with the bulk composition marked by point "A" in the diagram?

- Anorthite -> Forsterite -> Diopside
- Forsterite -> Anorthite -> Diopside
- Forsterite -> Diopside -> Anorthite
- Anorthite -> Diopside -> Forsterite**



44. As per the Bowen's reaction series, which one of the following represents the correct order of crystallization of minerals

- Olivine -> Biotite -> Mg-pyroxene -> Amphibole -> Mg-Ca pyroxene
- Biotite -> Olivine -> Mg-Ca pyroxene -> Mg-pyroxene -> Amphibole
- Mg-pyroxene -> Mg-Ca pyroxene -> Olivine -> Amphibole -> Biotite
- Olivine -> Mg-pyroxene -> Mg-Ca pyroxene -> Amphibole -> Biotite**

45. Which one of the following mechanisms facilitate separation of crystals and liquid when the amount of trapped intercumulus liquid between cumulate minerals is > 60 vol.%

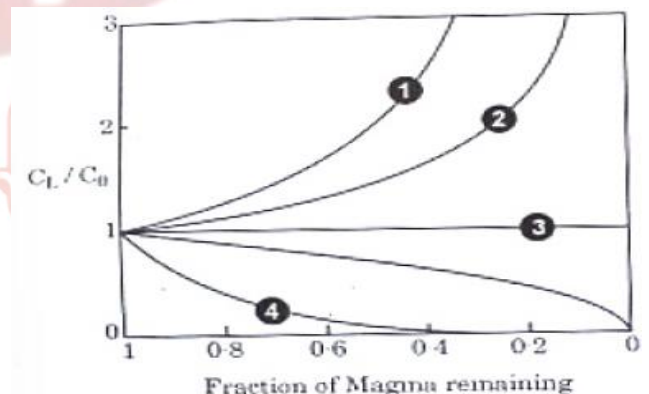
- Flow segregation
- Filter pressing**
- Gravity settling
- Grain dispersive pressure

46. Which one of the given trace element ratios can be used to discriminate olivine fractionation from clinopyroxene fractionation?

- La/Y
- K/Rb
- Sr/Ba
- Ni/Cr**

Ni and Co are concentrated in olivine, and Cr is concentrated in spinel and clinopyroxene

47. Consider the following diagram related to Rayleigh fractionation showing the enrichment/depletion (C_L) of trace elements in a crystallizing magma relative to their concentrations in the original melt (C_0):



Which one of the following statements is correct with respect to the above diagram?

- Elements (1) and (2) are incompatible while elements (3) and (4) are compatible.
- Elements (1) and (2) are compatible while elements (3) and (4) are incompatible.
- Elements (1) and (2) are incompatible while element (4) is compatible.**
- Element (3) partitions equally into solids and melt while element (4) partitions preferentially into the melt.

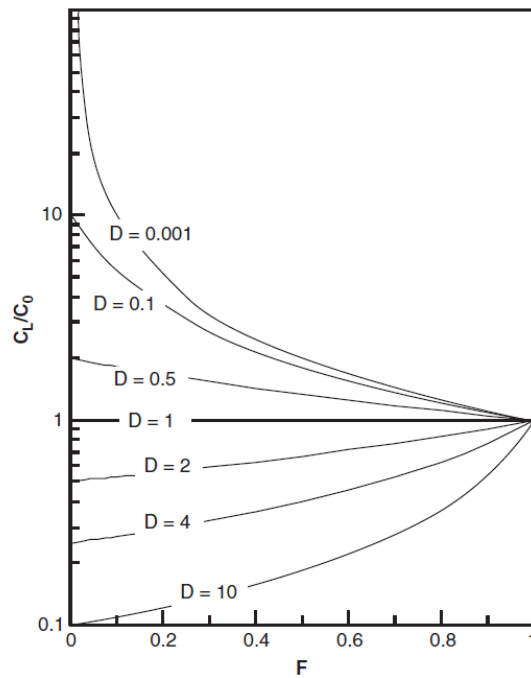
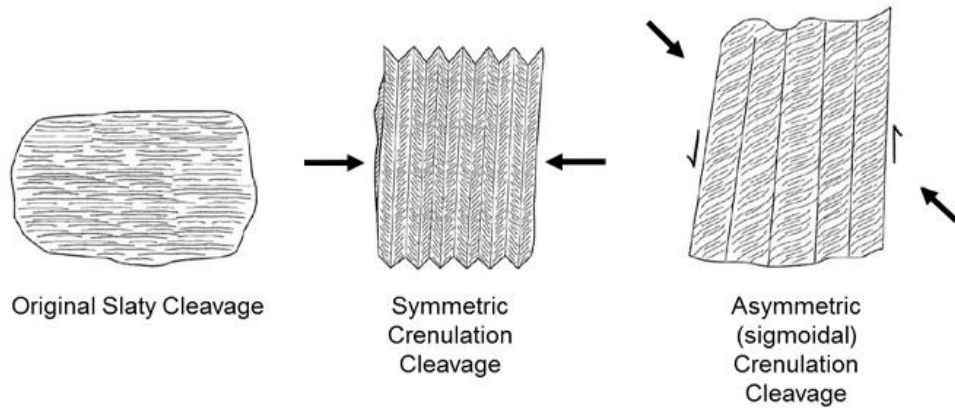


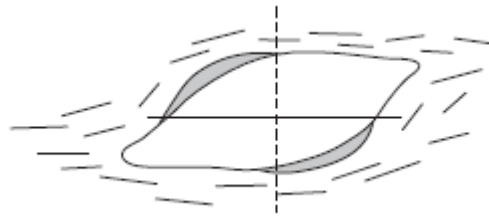
FIGURE 2 Variation in the relative concentration of a trace element in a liquid versus source rock as a function of \bar{D} and the fraction melted, using Equation (5) for equilibrium batch melting.

48. Which one of the following is not a potassic group of rocks?
- Lamproite
 - Kimberlite
 - Komatite**
 - Shoshonite
49. Which one of the following is the most appropriate example of high-stress metamorphism?
- Dynamic metamorphism**
 - Contact metamorphism
 - Burial metamorphism
 - Ocean-floor metamorphism
50. Which one of the following type of metamorphic reactions can be successfully used for Geothermometry?
- Reactions involving fluid
 - Polymorphic transition reactions
 - Terminal reactions
 - Exchange reactions**
51. The low temperature limit of metamorphism is generally considered to be :
- 350°C+ 50°C
 - 50°C + 50°C
 - 150°C+ 50°C**
 - 450°C+ 50°C
52. The cleavage related to micro-folding of pre-existing foliation is called:
- Fracture cleavage
 - Lineation
 - Crenulation cleavage**
 - Slaty cleavage



53. In a metamorphic rock, when solution transfer dissolves a matrix mineral from high-stress areas and reprecipitates it in low-stress areas adjacent to a porphyroblast. it produces:

- a. Kink bands
- b. Pressure shadow zones**
- c. Deformation twins
- d. Micro-boudinage



54. A type of granoblastic texture found in a fine grained rock in the contact aureole of an intrusion is called

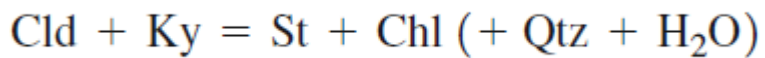
- a. Hornfels**
- b. Porphyroblast
- c. Mosaic texture
- d. Idioblast

55. Porphyroblasts which grow over randomly oriented grains in matrix, prior to the development of foliation are called:

- a. Inter-tectonic porphyroblasts
- b. Pre-tectonic porphyroblasts**
- c. Syn-tectonic porphyroblasts
- d. Post-tectonic porphyroblasts

56. During progressive regional metamorphism of Fe-rich aluminous pelites, staurolite is produced at the cost of:

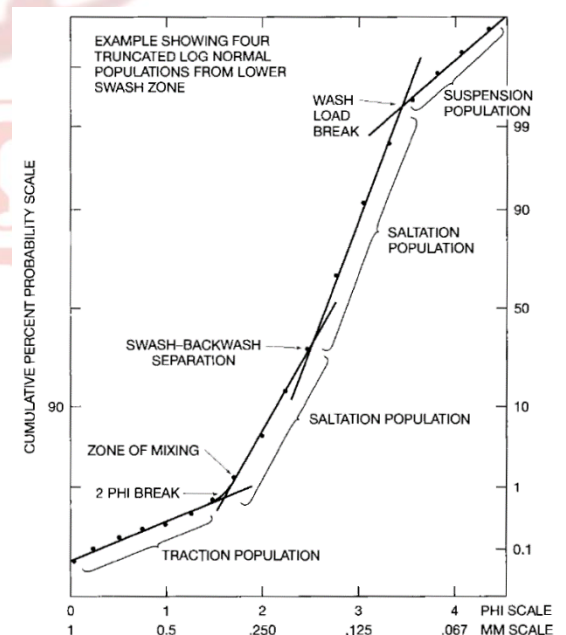
- a. Biotite
- b. Kyanite
- c. Muscovite
- d. Chloritoid**



Metamorphic Grade →

Metamorphic Facies	Greenschist	Transitional States	Amphibolite	Granulite			
Albite							
Plagioclase		Oligoclase		Andesine			
Epidote > An ₁₂							
Actinolite							
Hornblende							
Augite							
Orthopyroxene							
Chlorite							
Garnet							
Biotite							
Quartz							
Phengite							
Cummingtonite							
Zone for associated metapelites	Chlorite Zone	Biotite Zone	Garnet Zone	Staurolite and Kyanite Zones	Sillimanite-Muscovite Zone	K-feldspar-Sillimanite Zone	Cordierite-Garnet Zone

57. The stable mineral assemblage hornblende + plagioclase garnet + epidote in a mafic protolith represents the:
- Amphibolite facies**
 - Blueschist facies
 - Granulite facies
 - Eclogite facies
58. In low P/T type of prograde metamorphism, which one of the following is most appropriate?
- Andalusite is converted to sillimanite**
 - Sillimanite is converted to andalusite
 - Kyanite is converted to sillimanite
 - Sillimanite is converted to kyanite
59. A calc-silicate rock formed by metasomatic interaction between marble and granitic intrusion is called:
- Skarn**
 - Greenstone
 - Charnockite
 - Khondalite
60. Presence of the characteristic assemblage of garnet + clinopyroxene + plagioclase +/- hornblende is characteristic of which facies?
- Granulite facies**
 - Eclogite facies
 - Blueschist facies
 - Amphibolite facies
61. Calcite, gypsum and apatite are termed as:
- Carbonaceous constituents
 - Siliciclastic constituents
 - Chemical/biochemical constituents**
 - Terrigenous constituents
62. Three straight line segments are ideally demarcated when cumulative percentage data of sediment having normal grain size distribution is plotted on log probability paper. Which one of the following represents the correct ascending order of incidence among the three-line segments?
- Traction population- Saltation population - Suspension population**
 - Saltation population- Traction population- Suspension population
 - Suspension population- Saltation population - Traction population
 - Traction population- Suspension population - Saltation population



63. Which one of the following methods of grain size measurement is not preferred for unconsolidated fine-size sediment (fine silt and clay)?
- Sedigraph
 - Pipette analysis
 - Sieving**
 - Laser diffractometry

Description: The **SediGraph** method of particle size analysis is based on Stokes' Law. It measures the rate at which particles fall through a liquid with known properties. The SediGraph then calculates the equivalent spherical diameter of particles ranging from 300 to 0.1 micrometers

Pipette analysis is a grain size analysis technique that uses a 10 ml pipette to extract sediment solution samples. The pipette method is based on Stokes' law and is used to determine the grain size of silt (2–63 μm) and clay fractions

Sieving particle size analysis, also called gradation test, is a procedure used to determine the particle size distribution of a solid material. It's a traditional method for measuring solid particles ranging in size from 125 mm down to 20 μm

laser diffraction analyzers determine the particle size distribution over a very wide dynamic measurement range. Typically, a size range of 10 nm to 4 mm

64. Rarely migrated sand ridges in an eolian environment with unusual heights and in alternately opposite directions are called:
- Star dunes
 - Reversing dunes**
 - Seif dunes
 - Parabolic dunes

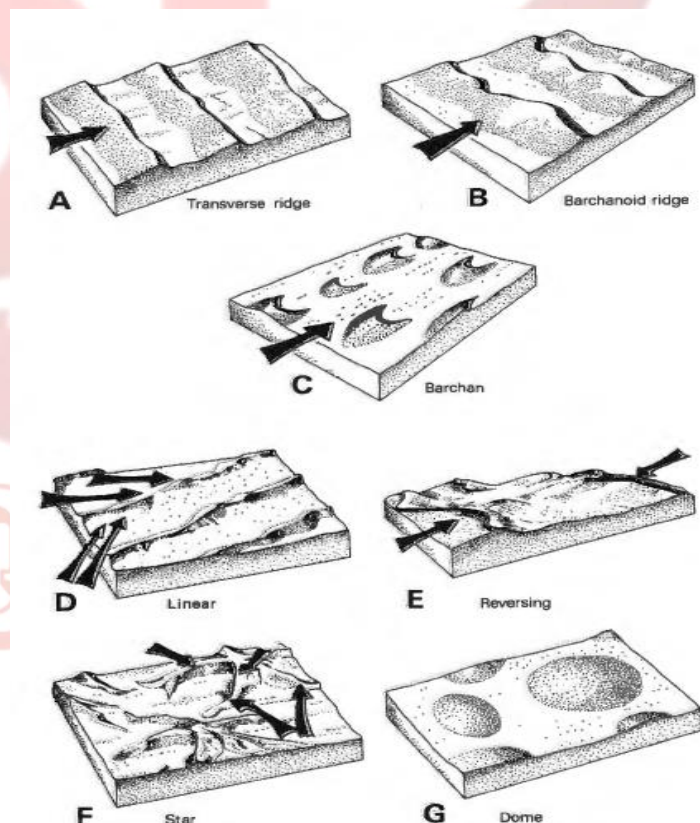
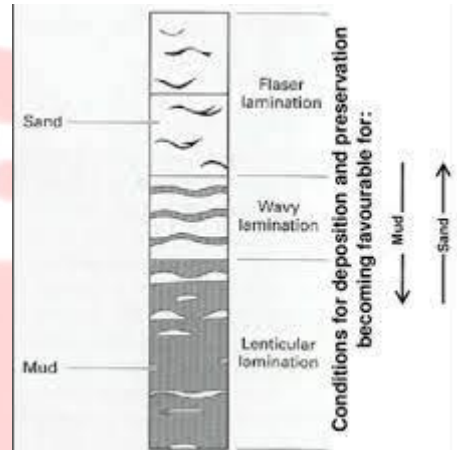


Fig. 10.17 Morphology of the major types of free dune. Arrows indicate the probable formative prevailing wind direction(s), although note that the origin of linear dunes is controversial (see Section 10.3.5.2). (After E. D. McKee (1979) United States Geological Survey Professional Paper 1052, Figs. 3–5, 7, 10–12, pp. 11–13.)

65. The paleocurrent vector data from sedimentary rocks are commonly plotted on a circular histogram. The diagram is called:
- Flower structure
 - Rose diagram**
 - Fence diagram
 - Pie diagram
66. Small lenses of sand in muddy beds, formed when sandy ripple is trapped in a muddy substrate, are called:

- Herring-bone cross-strata
- Flaser bedding
- Wavy bedding
- Lenticular bedding**

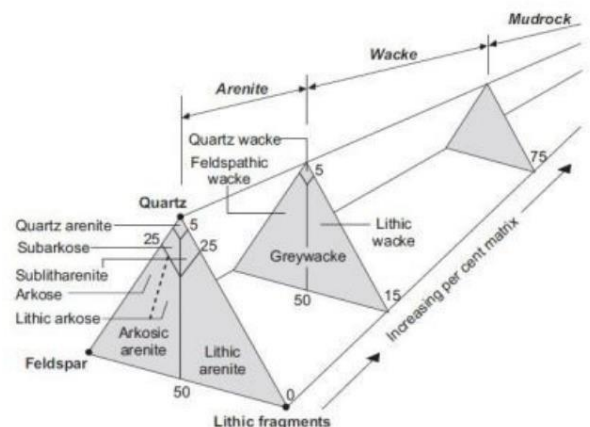


67. Based on depositional texture, an allochthonous limestone, with mud-supported fabric and > 10% grains of 0.03 - 2 mm size, is termed as:

- Packstone
- floatstone
- Wackestone**
- Grainstone

Depositional Texture Recognizable				Original components were bound together during deposition, as shown by intergrown skeletal matter, lamination contrary to gravity, or sediment-floored cavities that are roofed over by organic or questionably organic matter and are too large to be interslices.	Depositional Texture Not Recognizable (Subdivide according to classifications designed to bear on physical texture or diagenesis.)
Original Components Not Bound Together During Deposition		Grain-supported			
Contains mud (particles of clay and fine silt size, less than 20 microns)					
Mud-supported		Grain-supported		Boundstone	Crystalline Carbonate
Less than 10 percent grains	More than 10 percent grains	More than 10 percent mud	Less than 10 percent mud		
Mudstone	Wackestone	Packstone	Grainstone		

68. Quartz arenite is a sandstone that contains:
- At least 90% quartz and more than 15% matrix
 - At least 95% quartz and less than 16% matrix**
 - At least 90% quartz and less than 15% matrix
 - At least 95% quartz and more than 15% matrix



69. Hamada are the rocky terrains with vertical cliffs and flat rock surfaces in a:
- Desert**
 - Glacier valley
 - Beach
 - Delta plain

70. A broad expanse of unconfined sediment-laden runoff water that moves downslope in an alluvial fan surface at times of catastrophic discharge is referred to as:

- a. **Debris flow**
- b. Sheetflood
- c. Incised-channel flow
- d. Landslides

71. Consider the following statements regarding lahars:

Statement 1: A lahar is a debris flow that contains a significant proportion of material of volcanic origin.

Statement 2: Lahar is formed as a result of mixing of unconsolidated volcanic material with water and subsequent movement of the dense mixture as a sediment gravity flow.

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

- a. **Both the statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.**
- b. Both the statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
- c. Statement 1 is true, but statement 2 is false.
- d. Statement 1 is false, but statement 2 is true.

72. During diagenesis of carbonate rocks, all transformations of one mineral to itself or a polymorph, is called:

- a. Replacement
- b. Recrystallization
- c. Inversion
- d. **Neomorphism**

Description: Neomorphism refers to the wet metamorphic process in which diagenetic alterations systematically transform minerals into either polymorphs or crystalline structures that are structurally identical to the rock(s) from which they developed

73. When the organism's original skeleton materials have been washed away by the presence of pore water but replica of hard part is preserved, the related process is termed as :

- a. **Molding**
- b. Permineralization
- c. Replacement process
- d. Recrystallization

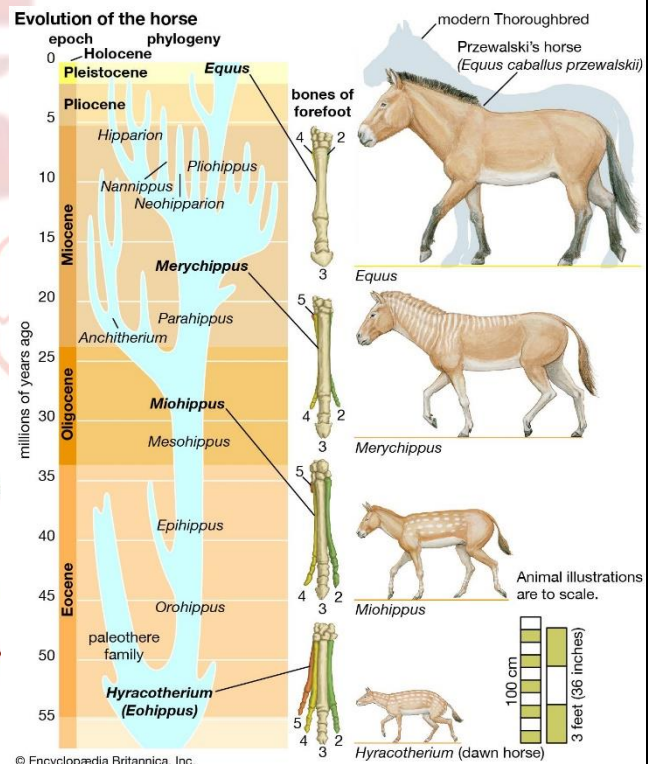
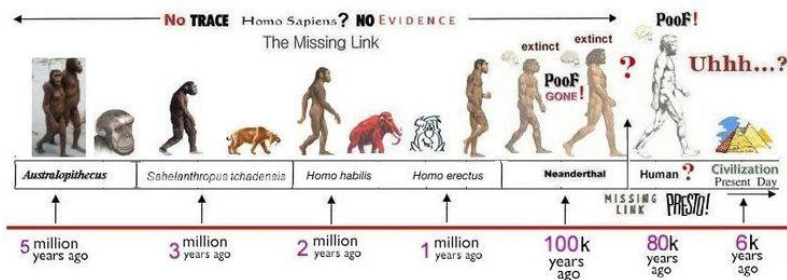
74. In a branching diagram that depicts proximity of relationship amongst species without a temporal dimension, the points where the branches join are termed as:

- a. Clade
- b. Sister clade
- c. **Nodes**
- d. Lineage sequence

75. A variety of dentition patterns are observed in Bivalves. Dentition pattern helps in classification of Bivalves. The correct dentition pattern which shows numerous subequal teeth arrangement in a sub parallel pattern is
- Taxodont**
 - Actinodont
 - Heterodont
 - Desmodont
76. What is the total geological range of Turritella?
- Miocene to Recent
 - Cretaceous to Recent**
 - Cambrian to Recent
 - Paleogene to Recent
77. Gastropod's egg turns into planktic larvae after hatching. The larvae are termed as:
- Veliger**
 - Trochophores
 - Velum
 - Osphradium
78. The most primitive type of eyes in Trilobites are known as :
- Holochroal**
 - Schizochroal
 - Abatochroal
 - Hypostoma
79. Brachiopods are sessile marine organisms and they are divided into number of classes on the
- Two dissimilar but equilateral valves
 - Presence and absence of hinge structure**
 - Presence of pedicle valve
 - Presence or absence of brachial valves
80. Which one of the following represents the correct sequence of evolution of horses?
- Merychippus - Parahippus - Pliohippus- Equus
 - Equus - Merychippus - Parahippus -Pliohippus
 - Mesohippus - Parahippus - Pliohippus- Equus**
 - Parahippus - Mesohippus - Pliohippus- Equus

81. Homo erectus evolved during:

- Pleistocene**
- Holocene
- Pliocene
- Miocene



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82. Which one of the following microfossil's higher abundance records can be used to decipher intensified Southwest Monsoonal Wind (summer monsoon) in the Western Arabian Sea?
- Globigerinoides sacculifer
 - Globigerina bulloides**
 - Globigerinoides ruber
 - Globorotalia menardii
83. Microfossil groups have a variety of shells or hard skeleton to protect their soft body parts. The term 'carapace' refers to the shell of:
- Diatom
 - Radiolaria
 - Ostracoda**
 - Conodont

84. Which of the following Fossil Group(s) could be used to do paleobiogeographic study of Gondwana Supergroup during Carboniferous and Permian Periods?
- Ammonoids
 - Glossopteris fauna only**
 - Mesosaurus flora only
 - Both Glossopteris and Mesosaurus flora

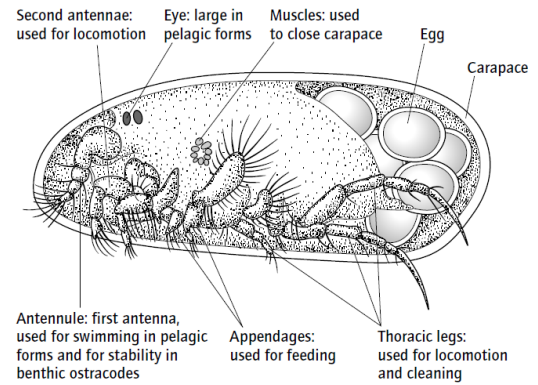


Fig. 13.10 Living ostracode morphology (female). This animal is about 1 mm in length.

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

List-I (Example)		List-II (Time Unit)	
P. Miocene		1. Period	
Q. Cretaceous		2. Era	
R. Palaeozoic		3. Age	
S. Meghalayan		4. Epoch	

	P	Q	R	S
a	3	2	2	4
b	3	1	2	4
c	4	2	1	3
d	4	1	2	3

86. Consider the following granitic bodies
- Erinpura Granite (900Ma)
 - Closepet Granite (2510Ma to 2530Ma)
 - Singhbhum Granite (SG A-3400Ma to 3300Ma, SG-B 3100Ma 3000Ma)

Which one of the following represents the correct order of granitic bodies according to their timing of emplacement (older to younger) ?

- 3-2-1**
- 3-1-2
- 1-2-3
- 2-3-1

87. Law of Superposition is applicable to a sequence of rock strata where the contacts are:

- a. Unconformable
- b. Faulted
- c. Thrusted
- d. Conformable**

88. Which one of the following lithostratigraphic units is known for manganese ores?

- a. Singhbhum Granite
- b. Sausar Group**
- c. Dongargarh Granite
- d. Betul Supergroup

89. The shield areas of various cratons evolved in four stages. One of these stages termed 'avlacogens' refers to the:

- a. Earliest stage**
- b. Last stage
- c. Third stage
- d. Second stage

90. Which one of the following represents the correct ascending stratigraphic order for Precambrian rocks of Bastar Craton?

- a. Amgaon Group - Sausar Group - Nandgaon Group - Dongargarh Granite
- b. Dongargarh Granite - Sausar Group - Amgaon Group - Nandgaon Group
- c. Nandgaon Group - Dongargarh Granite - Sausar Group - Amgaon Group
- d. Sausar Group - Nandgaon Group - Dongargarh Granite - Amgaon Group**

Kotri-Dongargarh Orogen		Rest of the craton	
1800– 2000 Ma]	Chilpi Group	1800– 2000 Ma	Chilpi Group = Sakoli Group
~2200 Ma	Khairagarh Group		
~2300	Dongargarh Granite	~2300	Malanjhand Granite] Kanker Granite
~2300 Ma	Nandgaon Group	2300 Ma	Sonakhan Group
~2400 Ma	Bailadila Group		
2500– 2600 Ma	Bengpal Group	2500– 2600 Ma]	Bengpal Group
		2600 Ma	Bhopalpatnam and Kondagaon granulites, Sukma granites
~3000 Ma	Amgaon Group	~3000 Ma	Sukma Group
> 3000 Ma	Gneissic Complex with vestiges of 3500-3600 Ma events		

91. The Banded Gneissic Complex forms the basement of:

- a. Aravali Group**
- b. Papaghni Group
- c. Singhbhum Group
- d. Chitradurga Group

92. The Jhamarkotra Formation in the Aravali succession is well known for :

- a. Iron ore deposits
- b. Gold deposits
- c. **Phosphorite deposits**
- d. Copper deposits

93. Varangian Glaciation occurred during:

- a. Cenozoic
- b. Mesozoic
- c. Paleoproterozoic
- d. **Neoproterozoic**

Description: Late Proterozoic glacial epochs have been grouped into three main periods namely: Lower Congo (c. 0.9 Ga), Sturtian (c. 0.8 Ga) and Varangian (c. 0.65 Ga),

94. The placer diamond-bearing conglomerate horizon of Vindhyan Supergroup is present within:

- a. **Rewa Group**
- b. Rohtas Formation
- c. Kaimur Group
- d. Kheinjua Formation

95. Which one of the following is the youngest marine formation of the Himalayas?

- a. Dagshai Formation (Late Eocene To Oligocene)
- b. Kasauli Formation (Late Oligocene To Middle Miocene)
- c. **Pinjor Formation (Pleistocene)**
- d. Subathu Formation(Late Paleocene To Mid Eocene)

96. Panjal volcanics of Lidar valley of Kashmir belong to:

- a. **Permian**
- b. Ordovician
- c. Cretaceous
- d. Carboniferous

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GEOLOGY OF INDIA

Table 6.1. Lithostratigraphic classification of the Palaeozoic sequence of the Kashmir Tethys Himalayan sequence in the Lidder Valley, Jammu and Kashmir (modified after Srikantia and Bhargava, 1983)

Age	Group	Formation	Thickness (m)	Middlemiss (1910)
Triassic	Sonamarg			
Upper Permian	Panjal	Zewan upper lava flows	2000	
Lower Permian	Volcanics	lower volcanogenic association	250	
Lowermost Permian to Carboniferous	Lidder	Pindobal	700	Agglomeratic slate
		Ganeshpur	1800	Fenestella Shale
		Aishmuqam	700	Passage Beds Syringothyris Lst.
Devonian	Chorgali	Wazura	500	
		Muth	1000	Muth Quartzite
Cambrian to Middle Silurian	Hapatnar	Rishkopal	500	
		Rangamal	400	
		Shumahal	3500	
		Base not exposed		

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

List-1 (mineral)		List-II (Mineral Class)	
P. Spodumene		1. Sulphosalt	
Q. Cassiterite		2. Silicate	
R. Galena		3. Sulphide	
S. Tetrahedrite		4. Oxide	

	P	Q	R	S
a	1	3	4	2
b	2	3	4	1
c	1	4	3	2
d	2	4	3	1

98. Consider the following statements

Statement 1: Higher concentration of chromium is found in felsic rocks of continental crust.

Statement 2: Podiform chromitites are never hosted in granitic rocks.

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

- a. 1 and 2
- b. 1 only
- c. 2 only**
- d. Neither 1 nor 2

99. Mineralization within the open spaces of a breccia or any other fragmental rock, that produces a special pattern of symmetrical banding or crustification together with host rock fragments coated with layers of inward radiating crystals is called:

- a. Cockade structure
- b. Colloform structure
- c. Comb structure**
- d. Replacement texture

100. Consider the following statements regarding genesis of mineral deposits:

- 1) Stratiform chromite deposits are formed by weathering of ultramafic rocks.
- 2) Nickeliferous laterite is a type of palaeo-placer deposit.
- 3) Gold bearing quartz veins are formed by hydrothermal process.

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

- a. 1 only
- b. 1 and 2
- c. 2 and 3
- d. 3 only**

Description: Stratiform chromite deposits are formed by early magmatic segregation And nickeliferous laterite is a residual concentration deposit

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101. Hydrothermal processes rarely yield Ni and V ore deposits. Which of the following statement(s) is/are the correct explanation for this?

- 1) Ni and V do not form strongly soluble complexes with common ligands in hydrothermal fluids.
- 2) Hydrothermal deposits form only in continental crust that has a poor concentration of Ni and V.

Select the answer using the code given below:

- a. 1 only
- b. 2 only
- c. **Both 1 and 2**
- d. Neither 1 nor 2

102. Which one of the following type of ore deposits is formed by hydrothermal process, but without any direct link to igneous activity?

- a. Porphyry Cu
- b. **SEDEX type Zn-Pb**
- c. Skarn W
- d. Greisen Sn

Description: Sedex is formed by the electrolytic water expelled by the sedimentary formation

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

	List-I (mineral)		List-II (Element)	
	P. Sphalerite		1. Tin	
	Q. Cuprite		2. Copper	
	R. Cassiterite		3. Silver	
	S. Aragonite		4. Zinc	
	P	Q	R	S
a	4	1	2	3
b	4	2	1	3
c	3	1	2	4
d	3	2	1	4

104. Assume that a stream is carrying identical size of detrital grains of chromite, magnetite, diamond and garnet. After repeated reworking of sediments in a clastic sedimentary environment, which one of the following minerals will have the largest grain size?

- a. Chromite
- b. **Diamond**
- c. Magnetite
- d. Garnet

Description: Diamond is the most resistant mineral

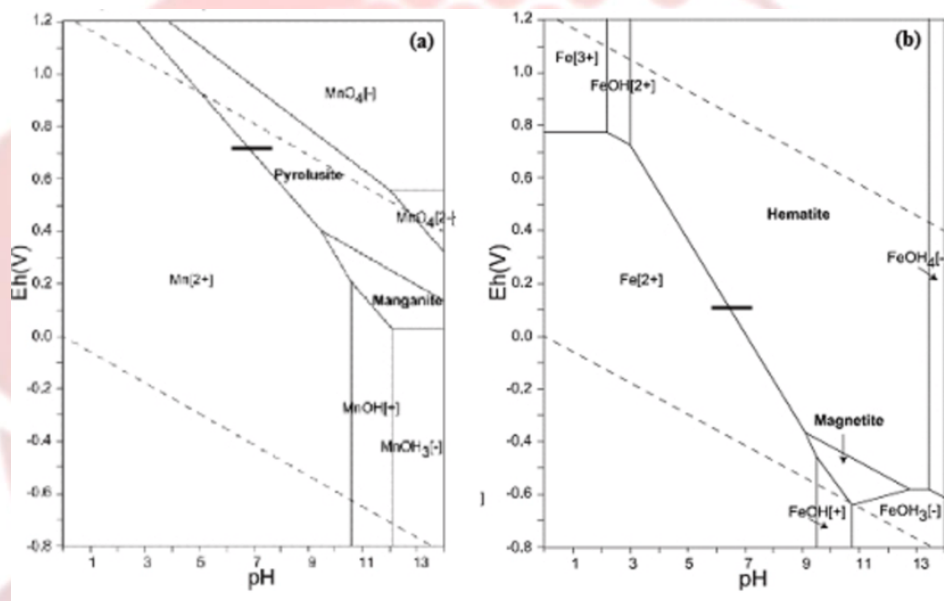
105. Consider the following statements with reference to formation of sedimentary Fe and Mn deposits.

Statement 1: In modern environment, Mn is better soluble in surficial water as against Fe.

Statement 2: The boundary between the conditions at which Mn^{2+} and Mn^{4+} species are dominant, is at lower oxidation levels than the equivalent boundary for Fe2 and Fe3+ species.

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



106. Finely divided plant residue composed of resistant plant products is called

- a. Anthraxylon
- b. **Attritus**
- c. Durain
- d. Clarain

107. Consider the following statements regarding petroleum generation:

Statement 1 : Thermal cracking process refers to the early biological and chemical changes that occur in organic-rich sediments at less than $50^{\circ}C$.

Statement 2 : Catalytic cracking is the dominant process in petroleum generation up to about $120^{\circ}C$.

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**

Description: Thermal cracking is a refining process that uses heat and pressure to break down, rearrange, or combine hydrocarbon molecules. It involves breaking down large hydrocarbons into smaller molecules

Catalytic cracking is a chemical process that converts heavy petroleum fractions into gasoline, alkene gases, and other petroleum products. It's used in petroleum refineries and the petrochemicals industry

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)
	P. sillimanite			1. Jhamarkotra
	Q. magnesite			2. Mangampet
	R. Phosphorite			3. Salem
	S. Barite			4. Sonapahar
	P	Q	R	S
a	2	1	3	4
b	2	3	1	4
c	4	3	1	2
d	4	1	3	2

109. Consider the following statements regarding storage coefficient

- 1-Storage coefficient can best be determined from pumping tests of wells,
- 2-Storage coefficient for an unconfined aquifer corresponds to its specific yield.

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

- 1 only
- 2 only
- Both 1 and 2**
- Neither 1 nor 2

110. The correct order of decreasing permeability of confining layers is :

- Aquitards, Aquifuges, Aquicludes
- Aquitards, Aquicludes, Aquifuges**
- Aquifuges, Aquicludes, Aquitards
- Aquifuges, Aquitards, Aquicludes

111. A ten-meter-thick confined aquifer has hydraulic conductivity of 10 m/day. The groundwater discharge through one meter saturated width of the aquifer under influence of the hydraulic gradient of 0.01 would be

- 10 m³/day
- 100 m³/day
- 1 m³/day**
- 0.1 m³/day

112. Which of the following are examples of secondary porosity?

- 1 . Fractures
- 2 . Solution openings
3. Bedding planes
4. Openings formed by plants

Select the correct answer using the code given below

- a. 1 and 3 only
- b. 2 and 3 only
- c. 1, 2 and 4 only**
- d. 1, 2, 3 and 4

Bedding planes are primary structures

113. Match List -I with list-II and select the correct answer using the code given below the list

List-I (Hydrological Parameter)		List-II (unit)	
P. Porosity		1. m^2/s	
Q. Hydraulic conductivity		2. m/s	
R. Transmissivity		3. m	
S. Head loss		4. Unit less	

	P	Q	R	S
a	3	1	2	4
b	4	2	1	3
c	4	1	2	3
d	3	2	1	4

114. In a homogeneous aquifer

- a. There is a spatial variation in the value of Transmissivity.
- b. There is directional variation in the value of Transmissivity and it varies in space.
- c. There is no directional variation in the value of Transmissivity and it is different at different locations.
- d. There is no spatial variation in the value of Transmissivity and it is same at all locations.**

Description: A homogeneous aquifer is a porous medium where the aquifer parameters are constant throughout the medium. This means the properties of the medium are independent of space

An aquifer is considered homogeneous if the hydraulic conductivity is the same. If the hydraulic conductivity is different, the aquifer is considered heterogeneous

115. Consider the following statements regarding Darcy's law :

- a. Rate of flow through porous media is proportional to the head loss.**
- b. Rate of flow through porous media is inversely proportional to the head loss.
- c. Rate of flow through porous media is proportional to the length of flow path.
- d. Rate of flow through porous media is inversely proportional to the length of flow path.**

116. Which one of the following is the correct expression for Reynolds number (NR)? (given ρ = fluid density, v = velocity of fluid, D = diameter of fluid pathway, μ = dynamic viscosity)

- a. $N_R = \frac{\rho \mu D}{v}$
- b. $N_R = \frac{\rho D}{v \mu}$
- c. $N_R = \frac{\mu v D}{\rho}$
- d. $N_R = \frac{\rho v D}{\mu}$

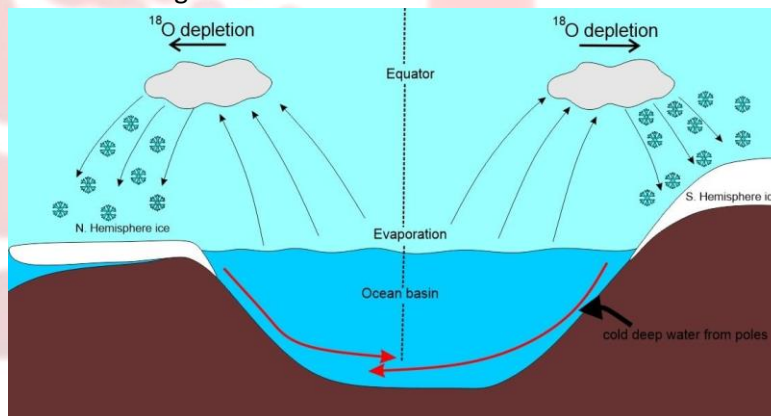
117. A groundwater sample contains 16 meq/L, 80 meq/L and 48 meq/L of Na^+ , Ca^{2+} and Mg^{2+} respectively, what will be the Sodium Adsorption Ratio (SAR) of the groundwater sample?

- a. 5
- b. 1
- c. 2
- d. 3

$$\text{SAR} = [\text{Na}] / (([\text{Ca}] + [\text{Mg}]) / 2)^{1/2}$$

118. Precipitation in areas with lower temperature or at higher latitudes will tend to have

- a. **Lower $\delta^2\text{H}$ and lower $\delta^{18}\text{O}$ values**
- b. Lower $\delta^2\text{H}$ and higher $\delta^{18}\text{O}$ values
- c. Higher $\delta^2\text{H}$ and lower $\delta^{18}\text{O}$ values
- d. Higher $\delta^2\text{H}$ and higher $\delta^{18}\text{O}$ values



119. Soil Aquifer Treatment (SAT) involves:

- a. Treatment of soil for better fertility
- b. Infiltration of untreated sewage effluent to the aquifer through recharge basins
- c. **Infiltration of appropriately treated sewage effluent to the aquifer through recharge basins for improvement in water quality**
- d. Injection of saline water into soil and aquifer

120. Consider the following statements regarding artificial recharge of groundwater projects

1. They are designed to maintain or augment the natural groundwater resource
2. They are designed to reduce or stop significant land subsidence.
3. They are designed to conserve or extract energy in the form of hot or cold water.

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

- a. 3 only
- b. **1 and 2 only**
- c. 1 and 3 only
- d. 1, 2 and 3