gg Gate 2007

ai25btech11014-Gooty Suhas

1) The maximum curvature of a cylindrically folded surface occurs at the

a) axial plane b) fold axis c) hinge d) limb

2) The plutonic equivalent of rhyolite is

a) diorite b) granite c) granodiorite d) monzonite

3) At a pressure of 14 kb and temperature of 600 °C, basalt would metamorphose to

a) amphibolite b) eclogite c) greenschist d) mafic granulite

4) Which is the most abundant sediment in the deep sea?

a) Clay b) Pebble c) Sand d) Silt

5) Which of the following is an ore mineral of iron?

a) Manganite b) Magnesite c) Malachite d) Magnetite

6) Bajada is

a) an arid region landform
b) a fluvial landform
c) a glacial landform
d) an oceanic landform

7) Which of the following does NOT lie within the Dharwar craton?

a) Bababudan Group
b) Closepet granite
c) Khairagarh volcanics
d) Kolar schist belt

8) In which of the following oil and gas fields is limestone the reservoir rock?

a) Bombay High
b) Cambay basin
c) Cauvery basin
d) Krishna-Godavari basin

9) In remote sensing, DTM is an abbreviation for

a) Day Time Mapping
b) Digital Triangulation Model
c) Digital Transverse Meridian
d) Digital Terrain Model

10) Which is the most abundant element in the solar system?

a) Hydrogen b) Iron c) Oxygen d) Silicon

11) Latitude correction applied for gravity data reduction is maximum at the latitude of

a) 0Â° b) 30Â° c) 45Â° d) 60Â°

12) The ratio of the Earth's total magnetic field at the Equator to that at the North Pole is

a) $\frac{4}{3}$ b) $\frac{3}{4}$ c) $\frac{2}{3}$ d) $\frac{1}{2}$

13) The apparent resistivity type curve recorded over the following three-layer section (top - dry soil; middle - saturated aquifer; bottom - bedrock) is

a) A-Type b) H-Type c) K-Type d) Q-Type

14) Self-potential method is used in geophysical prospecting of ore deposits predominantly containing

a) chalcopyrite b) chromite c) ilmenite d) magnetite

15) Deep earthquakes are associated with

a) mid-oceanic ridges
b) rift zones
c) subduction zones
d) transform faults

16) The average P-wave velocity in the continental crust is

a) 3.5 km/s b) 4.5 km/s c) 5.5 km/s d) 6.5 km/s

17) The amplitude of ground motion generated by an earthquake of magnitude 8 is greater than that of an earthquake of magnitude 5 by a factor of

a) 3 b) 100 c) 300 d) 1000

18) A P-wave is NOT a

a) dilatational wave
b) irrotational wave
c) longitudinal wave
d) rotational wave

19) Low velocity zone (LVZ) occurs globally at the base of the

a) asthenosphere b) crust c) lithosphere d) outer core

20) The fastest spreading divergent plate boundary is the

a) Carlsberg ridge
b) Central-Indian ridge
c) East Pacific rise
d) Mid-Atlantic ridge

21) An open fold may appear to be isoclinal when viewed in a section

a) at a low angle to the fold axis
b) at 45Â° to the fold axis
c) perpendicular to the fold axis
d) parallel to the axial plane

22) Glaucophane is a dense mineral because

a) Na occurs in the 'A' site while Al is in the octahedral site
b) Na occurs in the 'A' site while Al is in the tetrahedral site
c) Na occurs in the 'M4' site while Al is in the octahedral site
d) Na occurs in the 'M4' site while Al is in the tetrahedral site

23) When a hydrous fluid infiltrates a rock containing the assemblage wollastonite + calcite + quartz at a fixed pressure and temperature, the modal proportion of

a) calcite will increase at the expense of quartz and wollastonite
b) wollastonite will increase at the expense of quartz and calcite
c) quartz will increase at the expense of calcite and wollastonite
d) calcite and quartz will increase at the expense of wollastonite

24) Which of the following represents a correct magmatic fractionation sequence?

a) Basalt → Andesite → Dacite → Phonolite
b) Basalt → Andesite → Trachyte → Rhyolite
c) Basalt → Mugearite → Dacite → Rhyolite
d) Basalt → Mugearite → Trachyte → Phonolite

25) In the following figure, four rocks (W, X, Y and Z) undergo fractional melting. Which rock will require the highest temperature for complete melting? (Rock Y is of eutectic composition)

a) W
b) X
c) Y
d) Z

26) Which is the most common type of porosity in sandstone?

a) Mouldic b) Intraparticle c) Interparticle d) Shelter

27) Which of the following features is NOT a 'tool mark'?

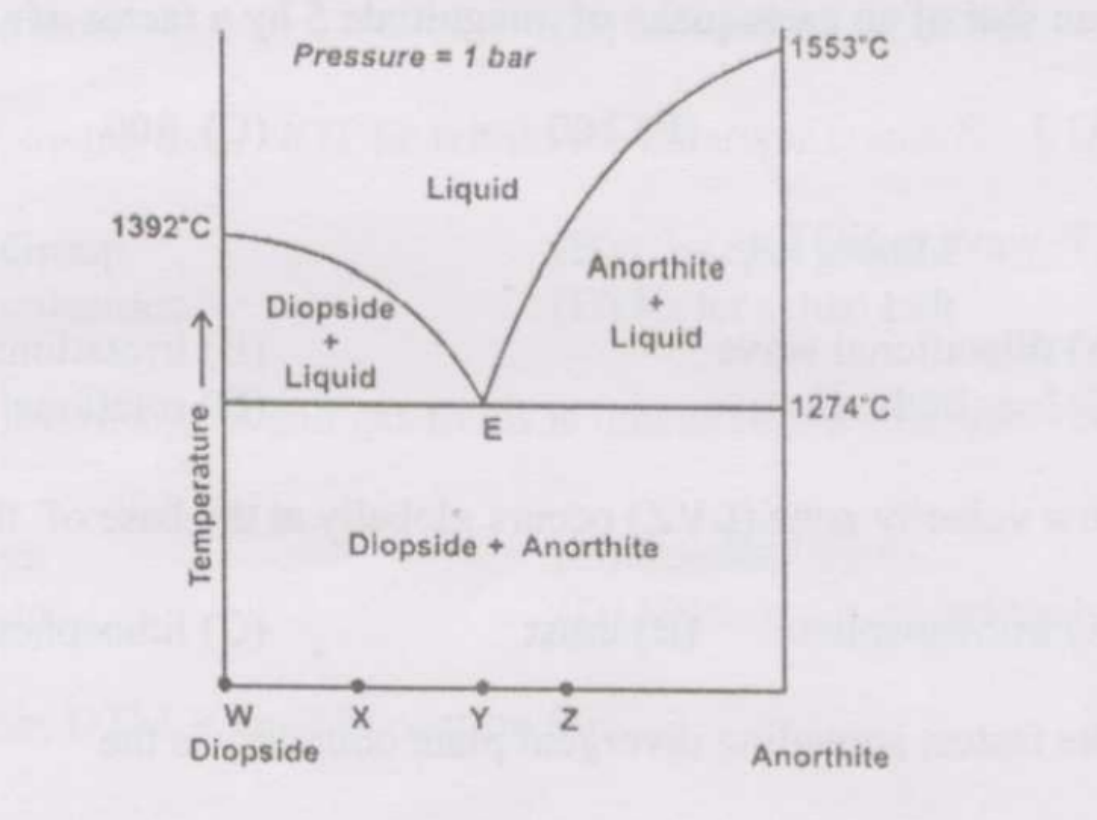

Fig. 1. Image of Question 25

a) Chevron mark b) Groove cast c) Load cast d) Prod mark

28) Match the following:

Group I:	**Group II:**
P. Lead	1. Magmatic
Q. Aluminium	2. Pegmatitic
R. Chromite	3. Residual
S. Muscovite	4. Hydrothermal

(A) P–2, Q–1, R–3, S–4 (B) P–4, Q–3, R–1, S–2 (C) P–3, Q–4, R–2, S–1 (D) P–3, Q–4, R–2, S–1

29) State the nature of the following reaction:
$Si^{+} + 4\,H_2O \longrightarrow H_4SiO_4 + 4\,H^{+}$

a) hydration b) hydrolysis c) oxidation d) reduction

30) Match the ionic species in Group I with their representative concentrations (ppm) in Group II, as found in meteoric water at 6Â°C.

Group I:	**Group II:**
P. Na^{+}	1. 2.4
Q. Mg^{2+}	2. 23.0
R. Ca^{2+}	3. 1.0
S. K^{+}	4. 5.1

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

31) Which of the following properties does NOT affect the permeability of sandstone?

a) Pore size
b) Tortuosity of pores
c) Sorting
d) Mineralogy of framework grains

32) Which of the following macerals has the lowest H/C ratio?

a) Alginite
b) Fusinite
c) Resinite
d) Sporinite

33) The paleoenvironmental condition indicated by the foraminiferal assemblage, Ammonia–Cibicides–Quinqueloculina is

a) abyssal
b) bathyal
c) non-marine
d) shelf

34) Match the bivalves in Group I with the dentitions in Group II.

Group I:	**Group II:**
P. Nucula	1. Desmodont
Q. Spondylus	2. Pachydont
R. Mytilus	3. Dysodont
S. Mya	4. Taxodont
	5. Isodont
	6. Schizodont

a) P–4, Q–5, R–3, S–1
b) P–4, Q–1, R–3, S–2
c) P–6, Q–5, R–1, S–3
d) P–6, Q–5, R–3, S–2

35) Match the following stratigraphic units in Group I with their corresponding ages in Group II.

Group I:	**Group II:**
P. Katrol Formation	1. Paleozoic
Q. Po Formation	2. Archean
R. Kheinjua Formation	3. Proterozoic
S. Dhokpathan Formation	4. Mesozoic
	5. Quaternary
	6. Tertiary

a) P–6, Q–1, R–3, S–5
b) P–4, Q–6, R–2, S–1
c) P–1, Q–4, R–1, S–6
d) P–4, Q–1, R–3, S–6

36) Match the minerals in Group I with their respective silicate structures in Group II.

Group I:	**Group II:**
P. Olivine	1. Nesosilicate
Q. Epidote	2. Sorosilicate
R. Biotite	3. Inosilicate
S. Quartz	4. Phyllosilicate
	5. Cyclosilicate
	6. Tectosilicate

a) P–1, Q–2, R–5, S–4
b) P–1, Q–6, R–2, S–4
c) P–3, Q–6, R–4, S–2
d) P–4, Q–5, R–6, S–1

37) Match the following shear zones in Group I with their tectonic settings in Group II.

Group I:	**Group II:**
P. Moyar–Bhavani Shear Zone	1. Eastern Ghats Mobile Belt
Q. Kui–Chitraseni Shear Zone	2. Southern Granulite Terrain
R. Nagavalli–Vamsadhara Shear Zone	3. Western Dharwar Craton
S. Jabanahalli Shear Zone	4. Aravalli–Delhi Fold Belt
	5. Singhbhum Craton
	6. Bhandara Craton

a) P–1, Q–2, R–5, S–4
b) P–6, Q–5, R–2, S–4
c) P–4, Q–2, R–6, S–1
d) P–2, Q–4, R–1, S–3

38) Which is the correct sequence of occurrence of the following thrusts in the Himalayan mountain belt along a south to north traverse?

a) Krol Thrust → Ramgarh Thrust → Almora Thrust → ITSZ
b) Ramgarh Thrust → Krol Thrust → Almora Thrust → ITSZ
c) Krol Thrust → Almora Thrust → Ramgarh Thrust → ITSZ
d) Almora Thrust → Ramgarh Thrust → ITSZ → Krol Thrust

39) Which of the following triple junctions is ALWAYS stable? (R = ridge; T = trench; F = transform fault)

a) F–F–F
b) R–R–R
c) T–R–F
d) T–T–T

40) Match the geomorphic features in Group I with their settings in Group II.

Group I:	**Group II:**
P. Nickpoints	1. Karst topography
Q. Pediplains	2. Paleosols
R. Duricrust	3. Moraine
S. Yardangs	4. Rejuvenation
	5. Desert
	6. Abrasion

a) P–1, Q–2, R–5, S–4
b) P–4, Q–5, R–2, S–6
c) P–6, Q–5, R–2, S–3
d) P–5, Q–3, R–1, S–2

41) A straight, steep mountain front, with little penetration of the alluvial fans into the range suggests the following:

a) wind erosion
b) slow uplift along an active fault
c) rapid uplift along an active fault
d) the presence of ancient inactive fault

42) At a fixed temperature, find the concentration (mole/litre) of ferric ion in solution if (i) solubility product of ferric hydroxide $K = 10^{-38.6}$ (ii) ionisation product of water $K_w = 10^{-14.2}$ (iii) pH = 7

a) 10^{-17} b) 10^{-7} c) 10^{+7} d) 10^{+17}

43) A basaltic lava flow is found to have a $^{87}Sr/^{86}Sr$ ratio of 0.720, and a $^{87}Rb/^{86}Sr$ ratio of 0.750. If the initial $^{87}Sr/^{86}Sr$ value is determined to be 0.704, what is the age of the flow? (Assume $\lambda = 1.42\times10^{-11}$ year^{-1})

a) 2.5×10^9 years b) 1.5×10^9 years c) 2.5×10^1 years d) 1.5×10^1 years

44) What are the normal (σ_n) and shear (τ) stresses acting on a plane that makes an angle of 30Â° with the maximum principal compressive stress (σ_1) direction? Given σ_1 = 10 kb and σ_2 = 5 kb.

a) σ_n = 5.25 kb; τ = 1.17 kb
b) σ_n = 6.25 kb; τ = 2.17 kb
c) σ_n = 7.25 kb; τ = 3.17 kb
d) σ_n = 8.25 kb; τ = 4.17 kb

45) Quartz can be optically distinguished from nepheline based on

a) relief
b) birefringence
c) optic sign
d) extinction angle

46) The Poisson's ratio of a rock with P– and S–wave velocities in the ratio of 3:1 is

a) 0.20 b) 0.25 c) 0.30 d) 0.35

47) A seismic reflection segment after migration
a) shallows and steepens
b) deepens and steepens
c) lengthens and deepens
d) shortens and deepens

48) The coverage obtained for a 12–geophone CDP profile with shot spacing equal to twice the geophone spacing is

a) 3–fold b) 6–fold c) 12–fold d) 24–fold

49) A P–wave incident on a horizontal interface between two layers at an angle of 30Â° generates a reflected S–wave. What is the angle of reflection of the S–wave? (The P– and S–wave velocities in the top layer are 4 km/s and 2.5 km/s respectively).

a) 12Â° b) 14Â° c) 16Â° d) 18Â°

50) The decimal number 27 is represented in binary form as

a) 11101 b) 11001 c) 10111 d) 11011

51) A salt dome is characterized by
a) low velocity and low density
b) low velocity and high density
c) high velocity and low density
d) high velocity and high density

52) Convolving two sampled signals $f(n) = \{1, 1, 2, 2\}$ with $g(n) = \{3, 2, 1\}$ results in a function $x(n)$ equal to

a) {1, 3, 7, 9, 10, 6}
b) {3, 5, 9, 11, 6, 2}
c) {3, 9, 6, 11, 2, 2}
d) {3, 5, 9, 6, 11, 5}

53) Arrange the following EM methods in order of increasing depth of investigation: P – Very Low Frequency method Q – Magnetotelluric method R – Ground Penetrating Radar method S – Slingram method

a) P ¡ R ¡ S ¡ Q b) S ¡ R ¡ P ¡ Q c) R ¡ P ¡ S ¡ Q d) P ¡ R ¡ Q ¡ S

54) Which of the following is measured in the time domain Induced Polarization method?
a) Transient decay of electric potential
b) Electric current injected into the ground
c) Electric potential and injected current
d) DC resistance only

55) In magnetotelluric method, EM source field is

a) a plane wave source
b) a spherical wave source
c) a cylindrical wave source
d) an elliptical wave source

56) In magnetotelluric method, phase angle derived from measured data over a homogeneous medium is

a) 0Â° b) 30Â° c) 45Â° d) 90Â°

57) For a fixed electrode spacing, arrange the following electrode configurations in the order of increasing depth of investigation: P – Schlumberger Q – Wenner R – Three electrodes S – Two electrodes

a) P ¡ Q ¡ S ¡ R b) P ¡ R ¡ S ¡ Q c) P ¡ R ¡ Q ¡ S d) P ¡ Q ¡ R ¡ S

58) The correct expression relating the gravitational (U) and magnetic (W) potentials is (G = universal gravitational constant, ρ = density, I = intensity of magnetization, α = direction of magnetization)

a) $W = -\dfrac{I}{G\rho}\dfrac{\partial U}{\partial \alpha}$

b) $W = -\dfrac{\rho}{G}\dfrac{\partial U}{\partial I}$

c) $U = -\dfrac{\rho}{G}\dfrac{\partial W}{\partial I}$

d) $U = -\dfrac{I}{G\rho}\dfrac{\partial W}{\partial \alpha}$

59) Magnetic survey was conducted from 8:00 A.M. to 12:00 noon. Observations:

Station No	1 (Base)	2	3	4	5	1 (Base)
Time	8:00	9:00	10:00	11:00	12:00	12:00
Total field (γ)	45500	45650	45750	45850	45850	45700

Which station shows the maximum anomaly after linear drift correction?

a) 2 b) 3 c) 4 d) 5

60) At 45N latitude, a spherical body having a radius 500 m, density 3.5 g/cc and magnetic susceptibility 5.0×10^{-6} CGS unit, lies at a depth of 1.0 km. Assuming present–day magnetic field, which statement is true if measurements are made along an E–W profile?

a) Both gravity and total magnetic field anomalies are symmetric
b) Gravity anomaly is symmetric and total magnetic field anomaly is asymmetric
c) Total magnetic field anomaly is symmetric and gravity anomaly is asymmetric
d) Both gravity and total magnetic field anomalies are asymmetric

61) Match the following:

Group I:	**Group II:**
P. Paramagnetic	1. Cobalt
Q. Diamagnetic	2. Ilmenite
R. Ferromagnetic	3. Pyroxene
S. Antiferromagnetic	4. Quartz

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

62) The difference in gravity measurements aboard two ships sailing towards each other in opposite directions (E–W) with a constant speed of 10 knots is 130 mgal at the crossing point of both the ships. At what latitude are the ships sailing?

a) 15Â° b) 30Â° c) 45Â° d) 60Â°

63) After decaying through 7 half–life periods, the original amount of radioactive substance that reduces to an amount of 64 is

a) 0.25 g b) 0.50 g c) 1.0 g d) 2.0 g

64) Number of atoms and disintegration constants of the parent (N_1, λ_1) and daughter (N_2, λ_2) radionuclides respectively in secular equilibrium are related as

a) $N_1 = \lambda_2 N_2$
b) $N_1\lambda_1 = N_2\lambda_2$
c) $N_1 = N_2\lambda_2$
d) $N_1\lambda_1 = \lambda_2 N_2$

65) What is the volume (%) of shale in a shaly–sand bed exhibiting a pseudo–static SP of –44 mV? (Static SP for clean sand = –55 mV)

a) 10 b) 20 c) 30 d) 40

66) If the saturation exponent in Archies equation is 2, the bulk resistivity of 50% water saturated formation increases in comparison to that of a fully water saturated formation by a factor of

a) 4 b) 8 c) 16 d) 32

67) Determination of formation porosity using neutron logging is based on

a) chlorine index
b) hydrogen index
c) neutron activation index
d) oxygen index

68) Which combination of logs is used to identify a gas zone based on the characteristic shape of the derived porosity plots?

a) Sonic and density
b) Resistivity and density
c) Density and neutron
d) Sonic and neutron

69) Inverse solution for an underdetermined problem can be constructed by

a) minimum norm inversion
b) least square inversion
c) regularized least square inversion
d) Marquardt inversion

70) Primary field source used in Slingram EM method is a

a) small circular loop
b) large rectangular loop
c) long grounded wire
d) long vertical transmitter

Common Data for Questions 71,72,73:

A P–wave generated from a surface source is incident at an angle of 15Â° on the horizontal interface between two 100 m thick layers with velocities V_1 = 2 km/s and V_2 = 4 km/s for the first and second layers respectively.

71) The crossover distance (metres) for a head wave from the interface between two layers is Given: P–wave incident at 15Â°, layer thickness = 100 m, V_1 = 2 km/s, V_2 = 4 km/s

a) 326 b) 336 c) 346 d) 356

72) A reflection from the base of the second layer is recorded at an offset (source–receiver) distance (metres) of

a) 160 b) 165 c) 170 d) 175

73) The total travel time (ms) taken for the P–wave generated at the surface to reach the detector after reflection from the base of the second layer is

a) 152 b) 157 c) 162 d) 167

Common Data for Questions 74, 75:

The figure below represents the geological map of an area. Based on the map, attempt questions 74 and 75. Contours depicted are in metres.

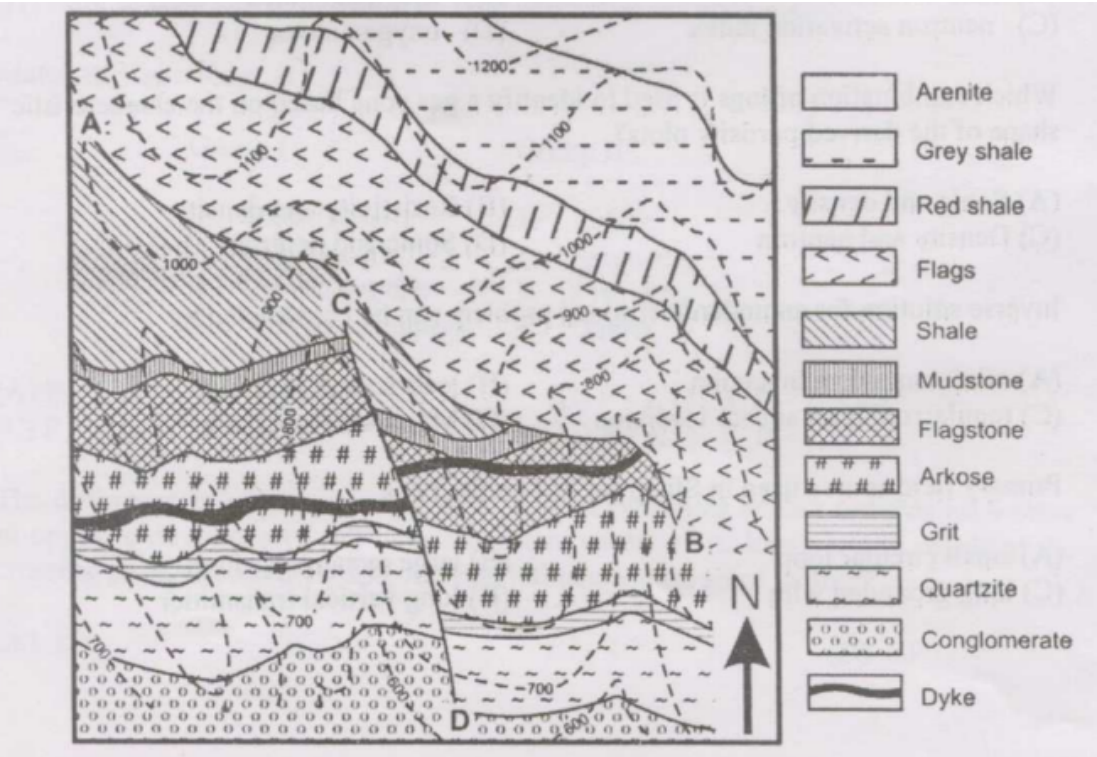

Fig. 2. Image for questions 74,75

74) What is the nature of the discontinuity AB (based on geological map)?
   a) Fault
   b) Disconformity
   c) Paraconformity
   d) Angular unconformity

75) The discontinuity CD represents a
   a) normal fault
   b) reverse fault
   c) strike-slip fault
   d) strike fault

Statement for Linked Answer Questions 76 and 77:

The discontinuities within the earth are marked by changes in velocity and density of the medium.

76) The velocity discontinuity within the earth at which the density of the medium is closest to the average density of the earth is

   a) Conrad b) Gutenberg c) Lehmann d) Mohorovicic

77) The change in P-wave velocity across the above discontinuity is

   a) 1.7 km/s b) 3.7 km/s c) 5.7 km/s d) 7.7 km/s

Statement for Linked Answer Questions 78 and 79:

In electromagnetic method of geophysical prospecting, the depth of investigation (skin depth), is a function of the physical property of the medium and frequency of the source field.

78) The expression for skin depth δ in a homogeneous medium with conductivity σ, magnetic permeability μ, and angular frequency ω is

   a) $\delta = \sqrt{\frac{2}{\omega\mu\sigma}}$ b) $\delta = \frac{1}{\omega\mu\sigma}$ c) $\delta = \frac{1}{\sqrt{\omega\mu\sigma}}$ d) $\delta = \sqrt{\omega\mu\sigma}$

79) The frequency of the EM source required to achieve a depth of investigation of 1 km in a medium of electrical resistivity of 4.0 Ωm and magnetic permeability of $4\pi \times 10^{-7}$ H/m is

   a) 1 Hz b) 10 Hz c) 100 Hz d) 1000 Hz

Statement for Linked Answer Questions 80 & 81:

Paleocurrent data for a sedimentary succession is as follows:

$N\,20^\circ\,E,\ N\,25^\circ\,E,\ N\,30^\circ\,E,\ N\,15^\circ\,E,\ S\,20^\circ\,W,\ S\,25^\circ\,W,\ S\,30^\circ\,W,\ S\,15^\circ\,W,\ N\,25^\circ\,E,\ S\,25^\circ\,W$

80) The rose diagram generated from the paleocurrent data is

a) bimodal – bipolar
b) polymodal
c) trimodal
d) unimodal

81) Which environment of deposition can explain the above paleocurrent data?

a) Alluvial fan
b) Deep marine
c) Fluvial
d) Tidal flat

Statement for Linked Answer Questions 82 & 83:

A garnet peridotite contains 60% olivine, 25% orthopyroxene, 10% clinopyroxene, and 5% garnet. The partition coefficients (K_p) for cerium during melting are: olivine = 0.001, orthopyroxene = 0.003, clinopyroxene = 0.1, and garnet = 0.02.

82) During melting of the garnet peridotite, the bulk distribution coefficient of cerium is Given: Olivine – 60% – K_D = 0.001 Orthopyroxene – 25% – K_D = 0.003 Clinopyroxene – 10% – K_D = 0.1 Garnet – 5% – K_D = 0.02

a) 0.0124
b) 0.1240
c) 8.0650
d) 83.3300

83) The extent of equilibrium partial melting required to double the concentration of cerium in the melt compared to the source is

a) 5%
b) 20%
c) 35%
d) 50%

Statement for Linked Answer Questions 84 & 85:

A dipping limestone bed with a true width of 5 metres shows an apparent width of 10 metres on a horizontal surface.

84) What is the true dip of the limestone bed?

a) 70Â°
b) 50Â°
c) 30Â°
d) 10Â°

85) At what horizontal distance (metres) from the exposed upper surface of the bed should a vertical drill hole be made so as to intersect the top of the bed at a depth of 100 metres?

a) 73.2 b) 173.2 c) 273.2 d) 373.2