



ENTRANCE EXAMINATION FOR ADMISSION, MAY 2010.

M.Tech. (EXPLORATION GEO-SCIENCES)

COURSE CODE : 306

Register Number :

Signature of the Invigilator
(with date)

COURSE CODE : 306

Time : 2 Hours

Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you -1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

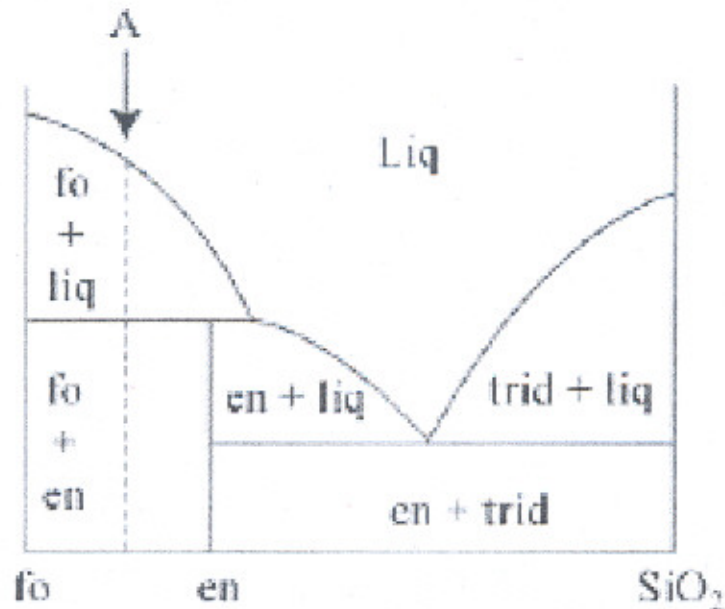
1. The mean radius of the Earth is 6371 km. On taking a gravimeter 1 km up in a balloon you would expect the value of g to decrease by
(A) 3% (B) 1% (C) 0.03% (D) 0.007%
2. The isostatic gravity anomaly over a topographic high is positive. It means
(A) Isostatic overcompensation
(B) Isostatic undercompensation
(C) Complete isostatic compensation
(D) Presence of deep root zone
3. Which of the following statements is NOT true?
(A) The planets revolve around the Sun in same directional sense
(B) Each planet is roughly twice as far from the Sun as its closest neighbor
(C) The Sun has almost 99.9 % of the angular momentum of the solar system while the planets account for more than 99% of the mass
(D) Great planets away from Sun have low densities
4. Which of the following seismic waves has highest velocity?
(A) P-wave (B) S-wave
(C) Rayleigh waves (D) Love waves
5. According to Richter scale of magnitude, an increase of 2 in magnitude of earthquake causes the increase in release of energy by
(A) 10 times (B) 100 times (C) 1000 times (D) 10,000 times
6. Seismic stations around the world have recorded a 'push' as the first motion. It means
(A) a single-couple source
(B) a double-couple source
(C) strong P-wave arrival
(D) an underground explosion
7. Epicentral distance of 180° equals to approximately how many kilometers on the surface of the earth (radius of the earth is 6371 km)
(A) 18000 km (B) 20005 km (C) 40010 km (D) 180 km

8. The rock-deformation is said to be Newtonian (viscous) when
- (A) strain is linearly proportional to stress
 - (B) rate of strain is linearly proportional to stress
 - (C) strain is not proportional to stress
 - (D) strain is independent of stress
9. Hawaiian-Emperor chain of oceanic islands is a result of
- (A) movement of Atlantic oceanic plate over a hot-spot
 - (B) movement of Pacific oceanic plate over a hot-spot
 - (C) subduction of Atlantic oceanic plate
 - (D) subduction of Pacific plate
10. Igneous rocks usually associated with a mature Island-arc are
- (A) tholeiitic (B) calc-alkaline (C) peralkaline (D) carbonatites
11. Suture Zone present in an orogenic belt is characterized by
- (A) Oceanic crustal rocks and arc-trench sediments
 - (B) Molasse sediments
 - (C) Normal faults
 - (D) Horst and graben structures
12. Aulacogen type of sedimentary basins form due to
- (A) Failing of one of the rifts of triple-rift junction
 - (B) Thrusting in a collision related mountain building process
 - (C) Strike slip faulting along the margin of continent
 - (D) Subsidence due to normal faulting
13. Which of the following is an example of continent-rifting?
- (A) Basin and Range Province of USA
 - (B) Eastern Ghats of India
 - (C) Emperor-Hawaiian chain of islands
 - (D) Isua province of Greenland

14. The interfacial angle between the faces of tetrahedron is
 (A) 45° (B) 90° (C) $54^\circ 44' 8''$ (D) $109^\circ 28' 16''$
15. Which one of the following forms does NOT belong to the isometric system?
 (A) pyramid (B) diploid (C) octahedron (D) tetrahedron
16. The number of space lattices and point groups present in all types of crystals are _____ and _____ respectively.
 (A) 32 & 230 (B) 30 & 232 (C) 14 & 32 (D) 16 & 30
17. A mineral gives X-ray diffraction peak at $2\theta = 60^\circ$. Assuming that the X-ray wavelength is 1.5 \AA calculate the d-spacing.
 (A) 0.5 \AA (B) 0.75 \AA (C) 1.5 \AA (D) 3.0 \AA
18. The unit cell parameter for rutile is $a:c = 1:0.64$. If $d_{(100)} = 4.6 \text{ \AA}$ what is the unit cell volume (in cubic \AA)?
 (A) 62.3 (B) 97.336 (C) 31.1 (D) 21.16
19. What is the appropriate crystal section to determine the extinction angle of a monoclinic crystal?
 (A) (100) (B) (110) (C) (010) (D) (111)
20. Which one of the following mineral is optically biaxial?
 (A) Calcite (B) Aragonite (C) Siderite (D) Dolomite
21. Which one of the following mineral is uniaxial negative in optical properties?
 (A) Zircon (B) Quartz (C) Nepheline (D) Rutile
22. Refractive indices of olivine increase
 (A) with increase in Fayalite content (B) with decrease in Fayalite content
 (C) with increase in zoning (D) with increase in size
23. Out of the three polymorphs of aluminum silicates
 (A) Sillimanite is the high temperature polymorph, while Kyanite is high pressure
 (B) Andalusite is the high temperature polymorph while sillimanite is high pressure
 (C) Kyanite is the high temperature polymorph while sillimanite is high pressure
 (D) Sillimanite is the high temperature polymorph while andalusite is high pressure

24. An example of a Pyroxene in which more than two thirds of the M2 sites are occupied by Ca cations
 (A) Enstatite (B) Diopside (C) Jadeite (D) Aegirine
25. Orthorhombic pyroxenes are similar to monoclinic pyroxenes in cell parameters except in the length of
 (A) a axis which is higher in orthorhombic than in monoclinic
 (B) b axis which is higher in orthorhombic than in monoclinic
 (C) c axis which is higher in orthorhombic than in monoclinic
 (D) a axis which is less in orthorhombic than in monoclinic
26. The group of clay minerals having 1:1 ratio of tetrahedral and octahedral components is
 (A) Kaolinite (B) Illite (C) Smectite (D) Vermiculite
27. Glaucophane is
 (A) a calcic amphibole (B) a white mica
 (C) a magnesium amphibole (D) an alkali amphibole
28. What are the major minerals present in peridotite?
 (A) pyroxene, biotite and quartz (B) olivine, pyroxene and spinel
 (C) amphibole, biotite and plagioclase (D) pyroxene, plagioclase and garnet
29. Identify the sequence of rocks arranged in the increasing order of density
 (A) Andesite, basalt, gabbro (B) Basalt, andesite, diorite
 (C) Andesite, gabbro, basalt (D) Gabbro, andesite, diorite
30. What is the temperature of crystallization of tholeiite basalt at 1 atm. P.?
 (A) 700°C (B) 900°C (C) 1200°C (D) 1700°C
31. When enstatite is heated to its melting point it gives rise to
 (A) melt of its composition
 (B) melt of different composition and quartz
 (C) melt of different composition and forsterite
 (D) melt of different composition and periclase

Consider the Figure below and answer the following three questions :



32. Cooling of magma of composition 'A' will result in crystallization of _____ as the liquidus phase.
 (A) Anorthite (B) Cristobalite (C) Enstatite (D) Forsterite
33. On reaching the peritectic point the magma will _____.
 (A) react with forsterite to form enstatite
 (B) crystallize enstatite and forsterite
 (C) crystallize enstatite only
 (D) crystallize enstatite and cristobalite
34. What is the final mineral assemblage that will result on equilibrium crystallization of the magma?
 (A) Enstatite + Forsterite
 (B) Enstatite + Tridymite
 (C) Tridymite + Enstatite + Forsterite
 (D) Enstatite + Anorthite + Tridymite
35. If melting point of a mineral is to be calculated using thermodynamic data then which one of the following is the correct equation? (H = enthalpy, S = entropy, V = molar volume, G = Gibb's free energy)
 (A) $T = \Delta H / \Delta S$ (B) $T = \Delta H / \Delta V$ (C) $T = \Delta G / \Delta S$ (D) $T = \Delta S / \Delta V$

36. During partial melting of mantle which one of the following elements behave as incompatible element?
 (A) Ni (B) Cr (C) Zr (D) Co
37. During partial melting of basalt under granulite facies name the minerals that will be left in the residue
 (A) Hornblende and garnet (B) Pyroxene and plagioclase
 (C) Hornblende and plagioclase (D) Pyroxene and quartz
38. Partial melting of an Olivine basalt at granulite facies gives rise to granodiorite magma. The concentration of Ce in the basalt is 6 ppm and in granodiorite magma is 60 ppm. Calculate the extent of partial melting in % assuming that Ce is an incompatible element with $D=0.001$.
 (A) 0.1% (B) 1% (C) 6% (D) 10%
39. A basaltic andesite magma undergoes differentiation and gives rise to dacite magma. The dacite has strong negative Eu anomaly, whereas, basalt has no Eu anomaly. What is the cause of -ve Eu anomaly in the dacite?
 (A) Fractional crystallization of pyroxene
 (B) Fractional crystallization of olivine
 (C) Fractional crystallization of plagioclase
 (D) Addition of plagioclase into dacite magma
40. An olivine basalt undergoes fractional crystallization of olivine which results in tholeiite basalt. What are the elements that will be depleted in the tholeiite basalt relative to its parent?
 (A) Ni and Mg (B) Cr and Zr (C) Cr and Ce (D) Ce and Fe
41. Pyroclastic rocks are formed as a result of explosive volcanism. What are the factors responsible for explosive volcanism?
 (A) Viscous magma and poor in volatile content
 (B) Viscous magma with high % of volatile content
 (C) Less viscous magma with high volatile content
 (D) Less viscous magma low with volatile content

42. The difference between Bingham magma and Newtonian magma is that
- Bingham magma flows turbulently
 - Bingham magma requires to be provided a yield stress to initiate flow
 - Bingham magma is less viscous
 - Stress is linearly proportional to strain in Bingham magma
43. Both temperature and deviatoric stress are important agents in case of _____ metamorphism.
- Dynamic
 - Thermal
 - Dynamo-thermal
 - Burial
44. Which of the following rocks is completely unfoliated?
- Slate
 - Schist
 - Mylonite
 - Granofels
45. Which one of the following minerals indicates low-P condition?
- Kyanite
 - Sillimanite
 - Cordierite
 - Garnet
46. The minerals glaucophane and jadeite are indicative of
- high-P and low-T
 - low-P and high-T
 - high-P and high-T
 - low-P and low-T
47. The 'Buchan-type' metamorphism is characterized by the following metamorphic zones with increasing grade
- Chlorite zone-Biotite zone-Garnet zone-Stauroilite zone-Kyanite zone-Sillimanite zone
 - Chlorite zone-Biotite zone-Stauroilite zone-Garnet zone-Kyanite zone-Sillimanite zone
 - Chlorite zone-Biotite zone-Cordierite zone-Andalusite zone-Sillimanite zone
 - Chlorite zone-Cordierite zone-Biotite zone- Andalusite zone-Sillimanite zone
48. Khondalites are characteristic rocks of
- Granulite facies
 - Greenschist facies
 - Amphibolite facies
 - Eclogite facies

49. What causes ice ages?
- (A) Variations in the earth's orbit
 - (B) Variations in sun's heat output
 - (C) Variations in sunlight reflected by the earth
 - (D) No definite cause has been conclusively proven
50. Glacial striations on an outcrop trend NE-SW. The direction of ice movement was
- (A) NE to SW
 - (B) NW to SE
 - (C) SW to NE
 - (D) could be either NE or SW
51. Water from a certain source is shown to contain 10,000 ppm dissolved solids. This indicates that _____ percentage of the *particles* in this water are represented by the dissolved solids.
- (A) 1%
 - (B) 10%
 - (C) 0.1%
 - (D) 0.001%
52. Lithification is the *primary* process in the formation of one of the following rocks.
- (A) gneiss
 - (B) schist
 - (C) conglomerate
 - (D) marble
53. Which of these would indicate the former presence of a glacial lake?
- (A) Varved clay
 - (B) Out wash sands
 - (C) Till
 - (D) Loess
54. A medial moraine is developed
- (A) on the side of a glacier
 - (B) in the bergschrund
 - (C) at the end of the glacier
 - (D) in the middle of two coalesced glaciers
55. Most limestones have a large component of calcite that was originally extracted from seawater by
- (A) inorganic chemical reactions
 - (B) chemical weathering
 - (C) lithification
 - (D) evaporation
56. The superposition of offshore facies over near shore facies occurs when there is a marine
- (A) superposition
 - (B) invasion
 - (C) regression
 - (D) transgression

57. Well-sorted sediments contain
- (A) a limited size range of particles (B) a wide size range of particles
(C) only pebbles (D) abundant clay minerals
58. A mature sedimentary rock would exhibit which of these features?
- (A) Unstable mineral fragments (B) Angular mineral fragments
(C) A wide variety of particle sizes (D) Stable mineral fragments
59. In a cliff, you see coal near the base, then sandstone above it, then limestone, then sandstone again, and finally coal near the top. This pattern most likely means
- (A) the sea retreated and then advanced again
(B) the sea advanced and then retreated again
(C) the climate changed from warm to cold and back
(D) rainfall decreased and then increased again
60. Which is most likely to represent a deposit formed on dry land?
- (A) Black shale (B) Red sandstone
(C) Mudrocks (D) Dolomite
61. Trellis drainage is most likely to develop on
- (A) natural levees (B) tilted sedimentary rock layers
(C) granite (D) horizontal layers of volcanic rocks
62. Which of the following controls flow velocity in streams?
- (A) Channel shape (B) Gradient
(C) Depth (D) All of these
63. Which of the following is a local base level?
- (A) Lake (B) Point bar (C) Ocean (D) Floodplain
64. A stream can lengthen its channel by
- (A) runoff (B) hydraulic action
(C) headward erosion (D) downcutting

65. Which factor does not directly influence the shape of a delta?
- (A) Intensity of wave action on the shore
 (B) Strength and height of tides
 (C) Volume of sediment carried by the river
 (D) None of the above
66. A stream that has more sediment to move than it can carry at one time is likely to be
- (A) mature (B) meandering (C) braided (D) youthful
67. Most ore forming processes taking place in the earth crust involve the transport of metals by
- (A) aqueous fluid and CO₂ rich fluid (B) aqueous fluid and magma
 (C) magma and CO₂ rich fluid (D) aqueous fluid
68. Magmatic ore deposits are commonly associated with
- (A) granite (B) syenite (C) gabbro (D) peridotite
69. Refer to previous question. The reason for such association is
- (A) low viscosity of parent magma (B) high viscosity of parent magma
 (C) low temperature of parent magma (D) high temperature of parent magma
70. Wollastonite deposits occur in one of the following.
- (A) granite (B) skarn (C) meta-pelite (D) limestone
71. Rare metal deposits are commonly associated with
- (A) carbonatite (B) syenite
 (C) granite pegmatite (D) gabbro
72. The following element associations are common in ore deposits. But in only one of these groups, the elements do not occur together in periodic table.
- (A) PGE (B) Au-Ag (C) Cu-Ni (D) Pb-Zn
73. One of the following pairs does not form exsolution intergrowth in ore mineral assemblages.
- (A) chalcopyrite-sphalerite (B) magnetite-ilmenite
 (C) pyrite-pyrrhotite (D) chalcopyrite-cubanite

74. One of the following ore minerals is commonly not idioblastic.
(A) pyrite (B) galena (C) magnetite (D) sphalerite
75. One of the following metals is not known to form any mineral in which it is a constituent element.
(A) Niobium (B) Cerium (C) Platinum (D) Rhenium
76. Solubility of water in silicate magma is controlled by
(A) Pressure and temperature of magma
(B) Pressure and composition of magma
(C) Temperature and composition of magma
(D) Availability of water
77. Magmatic ore deposits are more common in mafic-ultramafic rocks because of
(A) crystallization of ore minerals and rock forming minerals in same P-T condition
(B) lower viscosity of parent magma
(C) possibility of separation of immiscible liquids
(D) all of the above
78. High grade manganese ore mined from Sausar schist belt represent
(A) syn-sedimentary deposit
(B) metamorphosed sedimentary deposit
(C) supergene enrichment of (A)
(D) supergene enrichment of (B)
79. One of the following is a classic example of hydrothermal ore deposit.
(A) Malanjkhand copper deposit
(B) Zawar lead-zinc deposit
(C) BIF-hosted gold deposit in Chitradurga schist belt
(D) Chalk Hills magnesite deposit
80. There are very few Indian ore deposits for one of the following metals.
(A) Copper (B) Gold (C) Uranium (D) Nickel
81. Fluid inclusions in minerals are commonly found in size range (in microns) of
(A) 0.01 to 0.1 (B) 0.1 to 1 (C) 1 to 10 (D) 10 to 100

82. SEDEX type ore deposits are formed in
(A) sedimentary basins (B) continental crust
(C) oceanic crust (D) sea floor
83. One of the following ore deposits is related to meteorite impact.
(A) Broken Hill lead-zinc (B) Sudbury nickel
(C) Witwatersrand gold (D) Bushveld chromite
84. IOCG deposits refer to
(A) Indium-Osmium-Chromium-Gold (B) Iron-Osmium-Chromium-Gold
(C) Iron Oxide-Copper-Gold (D) Iron Oxide-Chromium-Gold
85. There is a relationship between crustal abundance of a metal and
(A) frequency of occurrence and size of its ore deposits
(B) its abundance in the mantle
(C) process of ore formation
(D) crustal level at which its ore deposits are formed
86. One of the following mineral deposits does NOT occur in skarn.
(A) Cu-Pb-Zn (B) Fe-Sn-W
(C) Wollastonite (D) Cr-Ni-Ti
87. One of the following metals is enriched in zinc ore.
(A) Cadmium (B) Silver (C) Gallium (D) Beryllium
88. One of the following ore deposits is not commonly formed by magmatic processes.
(A) Nickel (B) Titanium (C) Iron (D) Manganese
89. The age of Muth quartzite is
(A) Silurian (B) Devonian (C) Ordovician (D) Cambrian
90. The most ancient ancestor of man seems to have appeared during
(A) Paleocene (B) Eocene (C) Pliocene (D) Pleistocene

91. The main boundary thrust separates
 (A) Archaean and Cuddapah basin
 (B) Higher Himalaya from Lesser Himalaya
 (C) Siwalik from Higher Himalaya
 (D) Siwalik and Lesser Himalaya
92. Bays and headlands are generally found in shoreline of
 (A) submergence (B) emergence (C) neutral (D) faulted
93. Which type of coiling is rare in gastropoda?
 (A) Dextral (B) Sinistral (C) Armestral (D) Trochospiral
94. When did the Trilobite disappear from the Earth?
 (A) Devonian (B) Carboniferous
 (C) End of Permian (D) End of Cretaceous
95. The Ordovician period is known as the age of
 (A) crinoids (B) graptolites (C) brachiopoda (D) corals
96. Flat topped sea mounts are termed as
 (A) guyots (B) mesa (C) inselberg (D) monodnock
97. Dinosaurs are reported from the rocks of
 (A) Silurian (B) Devonian
 (C) Triassic (D) End of Permian
98. Mechanical wear by rivers, wind etc are called as
 (A) deflation (B) saltation (C) corrasion (D) solifluction
99. The drainage pattern which signifies an area lacking structural control is
 (A) radial (B) rectangular (C) dendritic (D) ellis
100. Dharwarian rocks have regional strike of
 (A) SW-NNE (B) W-SSE (C) WSW-ENE (D) NW-SE