ENTRANCE EXAMINATION FOR ADMISSION, MAY 2012.

M.Tech. (Exploration Geosciences) and Ph.D. (Earth Sciences)

COURSE CODE : 306/110

Register Number :

Signature of the Invigilator
(with date)

COURSE CODE : 306/110

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 of the 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. Earthquake shadow zone exists because
   (A) Outer core is in liquid state
   (B) Inner core is in solid state
   (C) Velocity of seismic wave increases with depth from the crust to the core
   (D) Velocity of seismic waves do not change at the core mantle boundary

2. Which of the following options represent inversion of the image about the dot shown in the following diagram?

(A) 
(B) 
(C) 
(D) 

3. Going from the bottom part to the top, which one of the following sequences is found in the ophiolite complex
   (A) Diabase dikes, basalt, gabbro, harzburgite
   (B) Harzburgite, gabbro, diabase dikes, basalt
   (C) Diabase dikes, gabbro, harzburgite, basalt
   (D) Harzburgite, gabbro, basalt, diabase dikes

4.

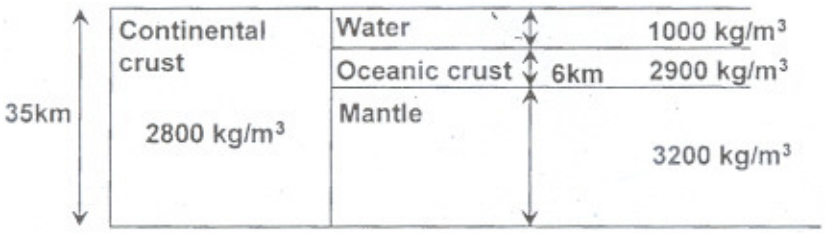

Figure shows densities of various units and thicknesses of some the units. The height of the water column in this case would be
   (A) 5.5km
   (B) 4.0km
   (C) 10km
   (D) 2.0km

5. Bagh beds are
   (A) Deccan traps
   (B) Inter-trappen beds
   (C) Infra-trappen beds
   (D) Supra-trappen beds

6. Hemeomorphy is an example of

(A) Convergent evolution
(B) Divergent evolution
(C) Parallel evolution
(D) Adaptive specialization

7. Lingula is an example of

(A) Living fossil
(B) Body fossil
(C) Trace fossil
(D) Micro fossil

8. The fossil group confined to Lower Paleozoic is

(A) Graptolite, Echinoid, Trilobite
(B) Brachiopoda, Graptolite, Trilobite
(C) Corals, Graptolites, Trilobites
(D) Brachiopoda, Gastraopoda, Trilobite

9. Specific heat of albite, quartz, orthoclase, andalusite are respectively 0.185, 0.182, 0.222 and 0.271 cal/g at 25 deg Celsius. When equal weights of these minerals are subjected to the same higher temperatures, which one will get heated fast?

(A) Albite
(B) Quartz
(C) Orthoclase
(D) Andalusite

10. Foraminifera have a time range from the

(A) Earliest Cambrian to the present day
(B) Jurassic to the present day
(C) Cambrian to Triassic
(D) Cretaceous to the present day

11. Horizontal component of the extra centrifugal force experienced by a moving object on the surface of the Earth is called as

(A) Eotvos force
(B) Coriolis force
(C) Centripetal force
(D) Milankovitch force

12. $^{232}_{90}Th$ decays to $^{208}_{82}pb$ by emitting 6 Alpha particles. How many β particles must be emitted in this process?

(A) 2 (B) 4

(C) 6 (D) 24

13. Mountains A and B with elevations of 2000m and 3000m with respect to average crustal level are in isostatic equilibrium. If the crustal density is 2.5g/cm^3 and mantle density is 3g/cm^3 then

(A) Mountain A has deeper root zone than B

(B) Mountain B has deeper root zone than A

(C) Both the mountains A and B have the same depth

(D) Mountain A is undergoing rapid uplift

14. The statement "for cyclical process the work produced in the surroundings is equal to the heat removed from surroundings" is a form of

(A) First law of thermodynamics (B) Second law of thermodynamics

(C) Third law of thermodynamics (D) Fourth law of thermodynamics

15. According to gibbs phase rule, the maximum number of phases possible in a rock crystallizing from a two component magma is

(A) 5 (B) 4

(C) 3 (D) 2

16. Which of the following is NOT true for Komatiites?

(A) These are ultramfic lavas (B) Are associated with greenstone belts

(C) Are of Archean age (D) Characterized by ophitic texture

17. Which of the given magma is more viscous?

(A) Basaltic magma (B) Granitic magma

(C) Mafic magma (D) Carbonatitic magma

18. Which of the following is a wrong statement about contact metamorphism?

(A) Result of thermal (and possibly metasomatic) effects of hot magma intruding cooler shallow rocks

(B) Adjacent to igneous intrusions

(C) May occur at low pressures

(D) Foliated rocks are a characteristic product

19. Grains crystallized during metamorphism that are significantly larger than those of the matrix are called

(A) Porphyroblast
(B) Poikiloblast
(C) Xenoliths
(D) Relic inclusions

20. A crystal that has only a center of symmetry belongs to point group

(A) 1
(B) 1 bar
(C) m
(D) no point group

21. Au skarn deposits are associated with intrusions of

(A) Calc-alkaline oxidised (magnetite bearing) I-type granite intrusions
(B) Calc-alkaline reduced (ilmenite bearing) S-type granite intrusions
(C) Mafic-intermediate composition
(D) Ultramafic composition

22. Volcanogenic massive sulfide deposits are associated with following tectonic setting

(A) Conservative plate margin
(B) Collisional plate margin
(C) Plate interior
(D) Spreading centres

23. Ni-Cu sulphide deposits are mainly associated with mafic-ultarmafic magma. They are formed because of the following process

(A) Segregation of early formed crystals
(B) Magmatic hydrothermal process
(C) Sulfide liquid immiscibility
(D) Partial melting and filter pressing

24. Which of the element is best pathfinder element for Au?

(A) Ag
(B) As
(C) Cu
(D) Pd

25. Porphyry type W deposits are associated with following type of intrusions

(A) Calc-alkaline oxidised (magnetite bearing) I-type granite intrusions

(B) Calc-alkaline reduced (ilmenite bearing) S-type granite intrusions

(C) Mafic-intermediate composition

(D) Ultramafic composition

26. Deep focus earthquakes are associated with following of the sedimentary basin

(A) Passive margin (B) Foreland basin

(C) Rift basin (D) Intracratonic basin

27. Which of the following sedimentary basins are characterized with highest heat flow?

(A) Passive margin (B) Foreland basin

(C) Rift basin (D) Intracratonic basin

28. The Algoma and Superior type BIFs are absent in geological records that are younger than

(A) 3.7 Ga (B) 2.6 Ga

(C) 1.85 Ga (D) 0.65 Ga

29. Under isobaric (i.e. equal pressure) condition H_2O solubility is the highest in

(A) Granitic magma (B) Andesitic magma

(C) Basaltic magma (D) Ultramafic magma

30. In a longitudinal geological cross sections of fluvial deposits, sands are encompassed by muds and the sand bodies have sheet like geometry, the probable depositional environment would be

(A) Alluvial fan deposit (B) Braided river deposit

(C) Meandering river deposit (D) Anastomosed river deposit

31. Which of the following conditions will favour maximum infiltration of rainwater into the ground?

(A) Prolonged, low intensity rainfall on vegetated sandy soils

(B) Short-lived, high intensity rainfall on vegetated sandy soils

(C) Prolonged, low intensity rainfall on bare sandy soils

(D) Prolonged, low intensity rainfall on vegetated clayey soils

32. Which of the following effects on the stream hydrograph are caused by urbanization?

(A) Decreased infiltration, increased runoff, increased peak flows, decreased baseflow

(B) Increased infiltration, decreased runoff, increased peak flows, decreased baseflow

(C) Decreased infiltration, increased runoff, decreased peak flows, increased baseflow

(D) Increased infiltration, decreased runoff, decreased peak flows, increased baseflow

33. Which of the following conditions will make an aquifer vulnerable to contamination?

(A) Shallow water table and thick vegetation cover

(B) Presence of a thick vadose zone

(C) Presence of a calcrete horizon below the soil

(D) Shallow water table and coarse grained soils

34. In general, groundwater divides and topographic divides do not frequently coincide in

(A) Glacial aquifers (B) Alluvial aquifers

(C) Karst aquifers (D) Coastal aquifers

35. Rivers braid due to

(A) Large sediment load (B) Abrupt increase in channel gradient

(C) Increase in dissolved load (D) High discharge

36. Entrenched meanders are generally associated with

(A) Antecedent drainage (B) Obsequent drainage

(C) Consequent drainage (D) Stream piracy

37. The soil moisture content beyond which gravity drainage begins is termed as

(A) Wilting point (B) Field capacity

(C) Saturation point (D) Drainage capacity

38. Consider an area underlain by an upper unconfined alluvial aquifer, and a lower confined aquifer. The upper aquifer is highly contaminated and not preferable for use. A well has to be designed so that it draws water only from the lower confined aquifer. Which of the following specifications should be adopted for the well

(A) Casing the whole well

(B) Screening the whole well

(C) Casing the unconfined aquifer and screening the confined

(D) Screening the unconfined and casing the confined

39. Which of the following effects are generally observed downstream of large dams?

(A) Erosion of river channel (B) Increase in peak discharge

(C) Channel aggradation (D) Decrease in low discharge

40. A stream that has adjusted its longitudinal profile such that it expends most of its energy in sediment transportation is termed as

(A) Resequent stream (B) Mature stream

(C) Graded stream (D) Consequent stream

41. PKIKP is a seismic body wave which travels through

(A) Only Upper mantle (B) Only upper and lower mantle

(C) Only mantle and outer core (D) Mantle, outer core and inner core

42. The Earth's magnetic field has undergone reversals in the past. The present field is named after

(A) Gauss (B) Brunhes

(C) Olduvai (D) Matuyama

43. ———— magnetometer is working on the principle of superconductivity

(A) Proton precession (B) Flux gate

(C) SQUID (D) Torsion

44. According to Pratt-Hayford isostatic model, density of the crust is

(A) Constant (B) Variable

(C) Zero (D) 2.65gm/cc

45. The Bouguer anomaly over the continents is generally

(A) Positive (B) Negative

(C) Zero (D) Constant

46. In gravity prospecting, gravity value is usually expressed in units of

(A) mGal (B) Gamma

(C) Wm^{-2} (D) m/s^2

47. Which logging method is used to measure the diameter of the well?

(A) Induction (B) Gravity

(C) Caliper (D) Sonic

48. The electrical method used for prospecting of disseminated ore is

(A) Induced polarization (B) Self potential

(C) Electromagnetic (D) Resistivity

49. The transfer of heat in conjunction with movement of material is called

(A) Conduction (B) Convection

(C) Radiation (D) Scattering

50. Which of the following is not related to the Milankovich cycles?

(A) Eccentricity of the Earth's orbit

(B) Obliquity of the Earth's rotational axis

(C) Precession of the Earth's rotational axis

(D) Tectonism on the Earth

51. The figure below is diagrammatic representation of development of stream on the limb of a recently uplifted fold. The stream "b" in the figure is a

(A) Consequent stream (B) Insequent stream

(C) Subsequent stream (D) Antecedent stream

52. INSAT is an example of

(A) Geostationary satellite
(B) Sun synchronous satellite
(C) Moon synchronous satellite
(D) Lunar stationary satellite

53. The elevation contour map of a hill shown below represents a

(A) Mesa
(B) Butte
(C) Plateau
(D) Cuesta

54. To find out latitude and longitude using Global Positioning System (GPS) how many satellites are sufficient?

(A) One
(B) Two
(C) Three
(D) Four

55. What happens when an older oceanic crust meets a younger oceanic crust at a convergent plate boundary?

(A) Older crust subducts beneath the younger crust
(B) Younger crust subducts beneath the older crust
(C) There would not be any subduction as both are oceanic crusts
(D) Both the plates collide to form an oceanic mountain ridge

56. A wood sample belonging to which of the following period can be dated using Carbon-14 method of dating?

(A) Pliocene
(B) Miocene
(C) Holocene
(D) Eocene

57. In a vertical aerial photograph, the principal point and the photocenter are

(A) Adjacent to each other
(B) Parallel to each other
(C) On the same spot
(D) At two ends of the photograph

58. In a satellite imagery of 1:50,000 scale, a bridge across a river measures 2 cm. What is the length of bridge on ground?

(A) 2 km
(B) 1 km
(C) 0.5 km
(D) 0.25 km

59. Deranged drainage pattern is typical of

(A) Glacial region
(B) Arid region
(C) Karst topography
(D) Coastal region

60. A watershed developed over a shale will have _____ drainage density than the one developed over sandstone

(A) Lower
(B) Higher
(C) Equal
(D) Variable

61. Which one of the following rocks can produce more amount radioactive heat from decay of long-lived radioisotopes?

(A) Tholeiitic basalt
(B) Peridotite
(C) Alkali basalt
(D) Granite

62. Petrified wood is an example of

(A) Encrustation
(B) Substitution
(C) Altercation
(D) Desiccation

63. Which of the following types of global change is unidirectional (i.e. not reversible)?

(A) Orogenic uplift
(B) Rock cycle
(C) Evolution of life on Earth
(D) Flooding intensity due to global warming

64. In which of the following places arkose is generally formed?

(A) A depositional area close to area of erosion
(B) A depositional area away from area of erosion
(C) Abyssal plane
(D) On carbonate platforms

65. The age of Muth quartzite is

(A) Silurian
(B) Devonian
(C) Ordovician
(D) Cambrian

66. Permian of Spiti region is represented by

(A) Kanawar Group
(B) Kuling system
(C) Agglomerate shale
(D) Cuddalore sand stone

67. Which of the following sedimentary stratification is produced and preserved below the fair weather wave base?

(A) Trough cross stratification
(B) Straight ripples
(C) Sinuous ripples
(D) Hummocky cross-stratification

68. Which of the following rocks possess higher amount of primary porosity?

(A) Sandstone
(B) Claystone
(C) Limestone
(D) Siltstone

69. Majority of worlds coal resources are restricted to the following geological time period

(A) Triassic
(B) Permo-carboniferous
(C) Cambro-Ordovician
(D) Eocene

70. Which rock type makes a good cap rock for oil and gas reservoirs?

(A) Conglomerate
(B) Limestone
(C) Sandstone
(D) Shale

71. The water entrapped in the interstices of sedimentary rock at the time of deposition is called

(A) Connate water
(B) Juvenile water
(C) Meteoric water
(D) Metamorphic water

72. An impermeable formation neither containing nor transmitting water are called:

(A) Aquifer
(B) Aquiclude
(C) Aquifuge
(D) Aquitard

73. Internal structure of which of the following can be deciphered using X-ray diffractrometer

(A) Opal
(B) Quartz
(C) Chalcedony
(D) Chert

74. Which of the following minerals are optically isotropic?

(A) Quartz
(B) Plagioclase
(C) Pyroxene
(D) Garnet

75. Which of the following minerals has higher concentration of Rare Earth Elements?

(A) Diposide (B) Zircon

(C) Dolomite (D) Ilmenite

76. Olivine's refractive index increases with increase in

(A) Ca to Mg ratio (B) Fe to Mg ratio

(C) Si to Mg ratio (D) Mg to Fe ratio

77. If a center of symmetry is added to point group 2, it results in point group

(A) m (B) 3

(C) 4/m (D) 1

78. Which of the following minerals is the same as ordinary rust and is the principal ore of iron?

(A) Sphalerite (B) Hematite

(C) Bauxite (D) Gypsum

79. Faces in a crystal that are related to each other by a 4 fold symmetry axes parallel to them form

(A) Prism (B) Pyramid

(C) Pinacoid (D) Pedian

80. The groundwater model that utilizes the similarity of two physical systems are known as

(A) Analog models (B) Mathematical model

(C) Physical model (D) System model

81. The symbol 'K' used in aquifer parameter estimation denotes

(A) Hydraulic conductivity (B) Specific yield

(C) Specific retention (D) Dynamic viscosity

82. Which of the following best defines a mineral and a rock?

(A) A rock has an orderly, repetitive, geometrical, internal arrangement of minerals; a mineral is a lithified or consolidated aggregate of rocks.

(B) A mineral consists of its constituent atoms arranged in a geometrically repetitive structure; in a rock, the atoms are randomly bonded without any geometric pattern.

(C) In a mineral the constituent atoms are bonded in a regular, repetitive, internal structure; a rock is a lithified or consolidated aggregate of different mineral grains.

(D) A rock consists of atoms bonded in a regular, geometrically predictable arrangement; a mineral is a consolidated aggregate of different rock particles.

83. Magma generation in subduction zones are mainly facilitated by

(A) Releasing of water and volatiles from the subducting plate

(B) Pressure increase in the subducting zone

(C) Temperature increase in the surrounding mantle wedge

(D) Both increase in temperature and pressure

84. Flint, chert, and jasper are microcrystalline forms of

(A) Quartz (SiO_2)

(B) Hematite ($Fe2O_3$)

(C) Halite (NaCl)

(D) Calcite ($CaCO_3$)

85. Which of the following is the most common type of chemical sedimentary rock?

(A) Limestone

(B) Chert

(C) Phosphate rock

(D) Quartz sandstone

86. Lateral offset in drainage lines is commonly associated with

(A) Normal faults

(B) Reverse faults

(C) Thrust faults

(D) Strike-slip faults

87. If sea-level drops or the land rises, what is likely to occur?

(A) Regression

(B) Transgression

(C) Tidal wave

(D) Decrease in the value of shorefront property

88. Which of these environments will produce sediments with cross-bedding?

(A) Deep ocean

(B) Swamp

(C) Tropical rain forest

(D) Desert

89. A turbulent, gravity driven flow consisting of water and sediment is known as a

(A) Evaporite

(B) Alluvial fan

(C) Turbidity current

(D) Calcareous ooze

90. Iron and magnesium ions are similar in size and both have a +2 charge. Therefore, we would expect

(A) iron and magnesium to bond easily

(B) iron and magnesium to share electrons

(C) iron and magnesium to be polymorphs

(D) iron and magnesium to substitute for each other in minerals

91. In $MgO\text{-}SiO_2\text{-}H_20$ system if there are four phases, then according to Gibbs phase rule the degree of freedom will be

(A) Three (B) One

(C) Two (D) Zero

92. For normal crustal metamorphic condition, dehydration reaction curves on P-T space (dP/dT) are always

(A) Concave upward (B) Convex upward

(C) Parallel to P-axis (D) Parallel to T-axis

93. Kyanite to Sillimanite transformation is characteristic of

(A) High P/T metamorphic facies series.

(B) Medium P/T metamorphic facies series.

(C) Low P/T metamorphic facies series.

(D) High T low P metamorphic facies series.

94. The reaction, $Ca_2Mg_5Si_8O_{22}(OH)_2$ (Tremolite) + $Ca_2Mg_3Al_4Si_6O_{22}(OH)_2$ (Tschermackite) +2 $NaAlSi_3O_8$ (Albite) = 2 $NaCa_2Mg_4Al_3Si_6O_{22}(OH)_2$ (Pargasite) + 8 SiO2 (Quartz) is a type of

(A) Devolatilization

(B) Solid-solid net-transfer

(C) Ion-exchange

(D) Polymorphic transformation - reaction.

95. Break down muscovite to K-feldspar, Sillimanite in pelitic rock indicates the transition from

(A) Greenschist → Blueschist

(B) Greenschist → Amphibolite

(C) Blueschist → Eclogite

(D) Amphibolite → Granulite

96. Flower structure is associated with

(A) Normal fault (B) Strike slip fault

(C) Thrust fault (D) Transform fault

97. If the pitch of the fold axis on axial plane is 90°, then the fold will be

(A) Upright fold (B) Inclined fold

(C) Reclined fold (D) Recumbent fold

98. In Ramsay's fold classification Class 2 folds are characterized by

(A) Core-converging dip-isogon (B) Parallel dip-isogon

(C) Core-diverging dip-isogon (D) Uniformly inclined dip-isogons

99. In a deformed rocks if both planar and linear fabric elements are well developed, then the rock can be termed as

(A) S-tectonite (B) L-tectonite

(C) LS-tectonite (D) Cleaved

100. Snowball garnet is characteristic feature of

(A) Syn-tectonic

(B) Post-tectonic

(C) Pre-tectonic

(D) Non-tectonic – deformation and recrystallization process.
