Hall Ticket No:

ENTRANCE EXAMINATION 2014
Ph.D. Earth and Space Sciences

Date: 07.02.2014
Time: 2.00-4.00 PM   **Marks: 75**

Instructions for the candidates:
i) All questions carry equal marks.
ii) Write your   Hall Ticket Number in the OMR Answer Sheet given to you. Also write the Hall Ticket Number in the space provided above.
iii) **There is negative marking. Every wrong answer carries 0.33 mark.**
iv) Hand over the OMR answer sheet at the end of the examination to the Invigilator.
v) No additional sheets will be provided. Rough work can be done in the question paper itself / space provided at the end of the booklet.
vi) Non-programmable calculators are allowed.

PART - A

1. What is the name for an erosion surface that separates two sets of sedimentary layers with non-parallel bedding planes?
   (A)cross-bedding   (B) formation
   (C) fault unconformity   (D) angular unconformity

2. Uranium-238 decays to which of the following daughter isotopes?
   (A) rubidium-87   (B)uranium-235
   (C) lead-206   (D) nitrogen-14

3. A stratigraphic sequence is a vertical set of strata
   (A) used as a chronological record of the geologic history of a region
   (B) that is unique to a specific area
   (C) that represents a repeating set of events such as recurring floods, debris flows
   (D) bounded above and below by igneous and/or metamorphic rocks

4. The coefficient of transmission of a perfectly black body is
   (A) Zero   (B) One   (C) 0.5   (D) 0.75

5. When the planet comes nearer the sun moves
   (A) fast   (B) slow   (C) constant at every point   (D) none of the above

6. Kepler's second law regarding constancy of arial velocity of a planet is a consequence of the law of conservation of
   (A) energy   (B) angular momentum (C) linear momentum (D) none of these

7. The period of geostationary artificial satellite is

(A) 24 hours   (B) 6 hours   (C) 12 hours   (D) 48 hours

8. A missile is launched with a velocity less than the escape velocity. The sum of its kinetic and potential energy is

(A) Positive   (B) Negative   (C) Zero   (D) may be positive or negative

9. What are the number of moles of CO2 which contains 16 g of oxygen?

(A) 0.5 mole   (B) 0.2 mole   (C) 0.4 mole   (D) 0.25 mole

10. The maximum number of isomers for an alkene with molecular formula C_4H_8 is

(A)5   (B) 4   (C) 2   (D) 3

11. The metal does not give H_2 on treatment with dilute HCL is

(A) Zn   (B) Fe   (C)Ag   (D)Ca

12. The metal used to recover copper from a solution of copper sulphate is

(A)Na   (B) Ag   (C) Hg   (D) Fe

13. Radiometric dating is least useful for which rocks?

(A) granitic   (B) basaltic   (C) metamorphic   (D) sedimentary

14. Which of the following represents the longest time period

(A) Precambrian   (B) Paleozoic (C) Mesozoic (D) Cenozoic

15. The term moment of momentum is called

(A)Momentum   (B)Force   (C)Torque   (D)Angular momentum

16. The value of determinant, two of whose rows are equal to is

(A) 0   (B) 1   (C) 2   (D) cannot be determined

17. The locus of a point equidistant from (1,2) (3,0) is

(A) 2x + 3y = 1   (B) 2x – 3y =2   (C) x -y = 1   D) 2x – 3y =3

18. Derivative of sinx with respect to logx is

(A) Cosx .logx + x.sinx   (B) logx. Sinx   (C) (sinx)/x   (D) x.sinx

19. Area of the triangle whose vertices are (0,0), (-3,0) and (0,6) is

(A)4.5   (B) 9   (C) 18   (D)36

20. Equation of line passing through (3,6) whose sum of intercepts is 0 is

(A)X+y-9=0   (B) x-y+3=0   (C) x+y-3=0   (D) x+y+9=0

21. Three sigma limits of Normal distribution cover an area of

(A) 99.45 %   (B) 99.73%   (C) 95%   (D) 68%

22. If the mean and variance of a binomial distribution is 6 and 2 then the value of probability of success is

(A)1/3   (B) 2/3   (C)1   (D)0

23. The mean, media and mode of normally distributed population lies at the

(A)Centre of the curve   (B) left side of the curve

(C) right side of the curve   (D) none of these

24. The oceans have a well-mixed surface layer approximately ____ meters thick

(A) 10   (B)50   (C)100   (D)200

25. If you mix two samples of water with different temperatures and salinities but the same density, you will produce a mixture that has

(A) a lower density

(B) a higher density

(C) the same density as the two samples

(D) cannot be predicted

PART -B

26. Large reptiles became abundant during the which Era?

        (A) Cenozoic (B) Mesozoic (C) Paleozoic (D) Precambrian

27. The lithosphere is approximately _____ kilometers thick

        (A) 1-2   (B) 5-10   (C) 50-100   (D)100-200

28. A mass M is moving with a constant velocity parallel to the X-axis. Its angular momentum with respect to the origin

        (A) Is zero   (B) Remains constant

        (C) Goes on increasing   (D) Goes on decreasing

29. A liquid does not wet the surface of a solid if the angle of contact is

        (A) Zero   (B) An acute one

        (C) 45°   (D) An obtuse one

30. The pressure just below the meniscus of water

        (A) Is greater than just above it   (B) Is less than just above it

        (C) Is same as just above it   (D)Is always equal to atmospheric pressure.

31. The metallurgical process in which a metal is obtained in a fused state is called

        (A) smelting (B) roasting (C) calcinations   (D) froth floatation

32. The molecular formula of phosphorous is

        (A) P_1 (B) P_2 (C) P_3 (D) P_4

33. The outer planets are composed mostly of

        (A) rocks and ice   (B) oxygen and nitrogen

        (C) hydrogen and helium   (D) helium and krypton

34. What powers the Earth's internal heat engine?

        (A) radioactivity   (B) solar energy

        (C) volcanoes   (D) ocean tides

35. Which of the following features is not associated with a transform plate boundary?

        (A) mid-ocean ridge   (B) earthquakes

        (C) deep sea-trench   (D) volcanic activity

36. The number of electrons presents in H^+ is

        (A) zero   (B)one   (C) two   (D) three

37. New seafloor is created at

        (A) deep sea trench   (B) mid-ocean ridge

        (C) subduction zone   (D) transform fault

38. Approximately how fast does an Earth lithospheric plate move?

        (A) several centimeters per year   (B)several centimeters per day

        (C) several centimeters per hour (D) several centimeters per second

39. What are the two most abundant elements by mass found in Earth

        (A) aluminum and iron   (B) sodium and chlorine

        (C) calcium and carbon   (D) oxygen and silicon

40. What is the dewpoint when the dry-bulb temperature is 24°C and the wet-bulb temperature is 15°C?

        (A) 8°C   (B) -18°C   (C) 36°C   (D) 4°C

41. Which mineral is white or colorless, has a hardness of 2.5, and splits with cubic cleavage?

        (A) calcite   (B) halite   (C) pyrite   (D) mica

42. The difference in texture between plutonic and volcanic rocks is caused by
    (A) different mineralogy   (B) different rates of cooling and crystallization
    (C) different amounts of water in the magma   (D) different chemical compositions
43. Bowen's Reaction Series illustrates relations between
    (A) temperature, viscosity, and mineral composition
    (B) temperature, chemical composition, and mineral structure
    (C) viscosity, temperature, silica content, and volatile content
    (D) temperature, pressure, and viscosity
44. The refractive index of the ocean water
    (A) increases with salinity   (B) increases with temperature
    (C) decreases with salinity   (D) decreases with temperature
45. Electromagnetic radiation
    (A) produces a time varying magnetic field and vice versa
    (B) once generated, remains self-propagating
    (C) is capable to travel across space
    (D) All of these
46. Leaf reflectance depends primarily on
    (A) the pigments   (B) internal cell structure
    (C) equivalent water content   (D) All of these
47. A cut diamond sparkles because of its
    (A) Hardness   (B) Emission of light by the diamond
    (C) High refractive index   (D) Absorption of light by the diamond
48. A plane mirror produces a magnification of
    (A) -1   (B) +1   (C) zero   (D) between zero and +1
49. By increasing the temperature, the specific resistance of a conductor and semiconductor
    (A) Increases for both   (B) Increases, decreases
    (C) Decreases for both   (D) Decreases for both
50. In hydrogen atom, when electron jumps from second to first orbit, then energy emitted is
    (A) - 13.6 eV   (B) - 6.8 eV   (C) - 27.2 eV   (D) None of these
51. Two identical wires of rubber and iron are stretched by the same weight, then the number of atoms in the iron wire will be
    (A) Equal to that of rubber   (B) More than that of the rubber
    (C) Less than that of the rubber   (D) None of the above
52. The bulk modulus of an ideal gas at constant temperature
    (A) is equal to its volume V   (B) is equal to its pressure p
    (C) is equal to p/2   (D) cannot be determined
53. A wire coil carries the current i. The potential energy of the coil does not depend upon
    (A) the value of i   (B) whether the coil has an iron core or not
    (C) the number of turns in the coil   (D) the resistance of the coil
54. The weight of a body at the centre of the earth is
    (A) zero   (B) same as on the surface of the earth
    (C) infinite   (D) none of the above
55. A cold soft drink is kept on the balance. When the cap is open, then the weight
    (A) increases   (B) first increases then decreases
    (C) decreases   (D) remains same

56. An object will continue moving uniformly until
   (A) the resultant force acting on it begins to decrease
   (B) the resultant force is at right angle to its rotation
   (C) the resultant force on it is zero
   (D) the resultant force on it is increased continuously

57. The theory of plate tectonics was not initially widely accepted because
   (A) land bridges would have blocked plate movement
   (B) rocks of the Earth's crust were considered too stiff for continents to move through them
   (C) fossils on South America and Africa did not match
   (D) ocean floor mapping showed that older rocks occur away from mid-ocean ridges

58. The Earth's lithosphere is broken into approximately how many large, rigid plates
   (A) 2   (B) 12   (C) 50   (D) 100

59. The process by which an originally homogeneous Earth developed a dense core and a light crust is called
   (A) metamorphism   (B) differentiation   (C) accretion   (D) compression

60. Which of the following is used by geologists to determine the relative ages in a rock sequence?
   (A) stratigraphy   (B) fossils
   (C) cross-cutting relationships   (D) all of these

61. The most malleable metal is
   (A) platinum   (B) silver   (C) iron   (D) gold

62. The material which can be deformed permanently by heat and pressure is called a
   (A) thermoplastic   (B) thermoset
   (C) chemical compound   (D) polymer

63. Which three groups of the Periodic Table contain the most elements classified as metalloids (semimetals)?
   (A) 1, 2, and 13   (B) 2, 13, and 14
   (C) 14, 15, and 16   (D) 16, 17, and 18

64. Which of the following is a type of stress?
   (A) shear   (B) compression   (C) tension   (D) all the above

65. Folding occurs when rocks behave as
   (A) brittle solids   (B) fluids   (C) ductile solids   (D) none of these

66. A structural basin is a special case of
   (A) a dome   (B) a syncline   (C) an anticline   (D) a freak of nature

67. A fault is observed where the hanging wall is displaced upward relative to the footwall.
   (A) This is a normal fault   (B) This is a reverse fault
   (C) This is a left-lateral strike-slip fault (D) This is a right-lateral strike-slip fault

68. Folds whose limbs are horizontal are known as
   (A) horizontal layers   (B) overturned folds
   (C) massively thrusted folds   (D) recumbent folds

69. Which of the following determines how quickly groundwater flows?
   (A) elevation   (B) permeability
   (C) water pressure   (D) all are important factors for groundwater flow

70. The average slope angle of the continental shelf is

        (A) 0.1°   (B)10°   (C)1°   (D)0.01°

71. Which is characteristic of mid-ocean ridges

        (A) shallow focus earthquakes   (B) high heat flow

        (C) basalt eruptions   (D) all of these

72. The oldest seafloor on Earth is not more than

        (A) 200 million years old   (B) 2 billion years old

        (C) 20 million years old   (D) 2 million years old

73. Fragments of ocean floor that escape subduction are known as

        (A) ophiolites   (B) migmatites   (C) granulites   (D) guyots

74. The value of $\tan 1.\tan 2.\tan 3. \ldots\ldots\ldots\ldots\tan 89$ is

        (A)1   (B) 0   (C) 4   (D) 2

75. The height of a person is 2 m and the length of his shadow is $2\sqrt{3}$ m. The angle of elevation of the sun is

        (A)60^0 (B) $30°$ (C) 45^0 (D) 75°

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