Hall Ticket No: [   ]

ENTRANCE EXAMINATION 2023

Ph.D. - Earth, Ocean and Atmospheric Sciences

Date:

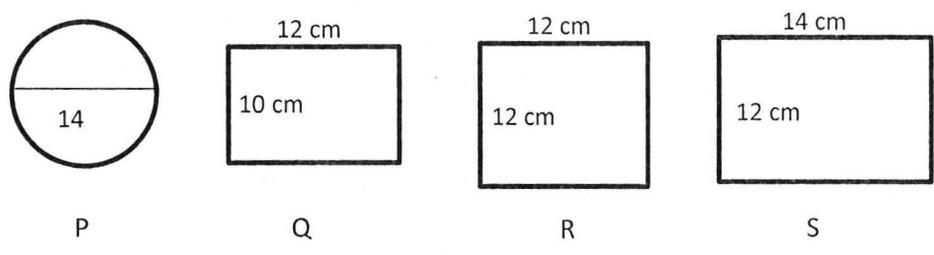Duration: Marks: 70

Instructions:

1. All questions carry equal marks.
2. There is no negative marking.
3. Write your Hall Ticket Number in the OMR Answer Sheet given to you. Also write the Hall Ticket Number in the space provided above.
4. The questions are fully in objective type and the answers are to be marked on the OMR answer sheet following the instructions provided there upon.
5. At the end of the examination, hand over the OMR answer sheet to the invigilator.
6. No additional sheets will be provided. Rough work can be done in the question paper itself / space provided at the end of the booklet.
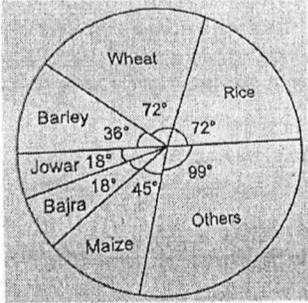7. Non-programmable calculators are allowed.

PART-A

1. Which of the following is considered as a type of RESEARCH?
   A. Descriptive vs Analytical
   B. Applied vs Fundamental
   C. Quantitative vs Qualitative
   D. All the above

2. What comes next in the given sequence KAL, LBM, NAO, OBP, QCR, ...
   A. RDQ
   B. RDS
   C. RCQ
   D. RCS

3. Full width at half maximum of the Gaussian function, $f(x) = Ae^{-(x^2/2\sigma^2)}$ is given by
   A. σ
   B. $\sigma\sqrt{2\ln(2)}$
   C. 2σ
   D. $2\sigma\sqrt{2\ln(2)}$

4. Which of the following NOT correct?
   A. Research relies on empirical evidence
   B. Research utilizes relevant concepts
   C. Research relies on Myth
   D. Research results into probabilistic predictions

5. If $P + \frac{1}{Q} = 1$ and $Q + \frac{1}{R} = 1$, then what is PQR?
   A. -1
   B. 2
   C. -2
   D. Can not be calculated

6. Which two figures have an equal area?

P	Q	R	S

   A. P and Q
   B. Q and S
   C. P and R
   D. P and S

7. Clock is showing accurate time in the morning at 11 a.m. How many degrees rotation of 'hour hand' will happened at 5 pm in the evening?
   A. 240
   B. 145
   C. 160
   D. 180

8. Which analysis comes under inferential analysis
   A. Univariate Analysis
   B. ANOVA Test
   C. Bivariate Analysis
   D. Multivariate Analysis

9. Coefficient of determination R^2 ranges from
   A. -1 to +1
   B. -1 to 0
   C. 0 to 1
   D. Indefiite

10. The correct order of following steps involved in the research process is: 1. Formulating the research problem; 2. Developing the hypothesis; 3. Collecting the data; 4. Analysis of data
    A. 1-2-3-4
    B. 2-3-4-1
    C. 3-4-2-1
    D. 3-2-1-4

2

11. The simple interest on a certain sum of money at rate of 5% p.a. for 8 years is 840. At what rate of interest, the same amount of interest can be received on the same sum after 5 years?
   A. 6%
   B. 8%
   C. 9%
   D. 10%

12. A tree increases annually by 1/8 of its height. By how much will it increase after 2.5 years if it stands today 8 m high?
   A. 10.75 m
   B. 11.85 m
   C. 12.25 m
   D. 15.60 m

13. Which level of plagiarism doesn't have penalty
   A. 0 - 10%
   B. 10% - 40%
   C. 40% - 60%
   D. Above 60%

14. The smallest square floor which can be completely paved with tiles of size 8x6, without breaking any tile, need 'n' tiles. Find 'n'
   A. 56
   B. 12
   C. 24
   D. 48

15. A sphere, a cylinder and a cone are made, each one with a radius of 'r' cm and a height of '2r' cm. Which one has the greatest volume?
   A. Cylinder
   B. Sphere
   C. Cone
   D. All have equal volume

16. A wall of 100 meters can be built by 7 men or 10 women in 10 days. How many days will 14 men and 20 women would take to build a wall of 600 meters?
   A. 20
   B. 15
   C. 25
   D. 30

17. Land distribution of different food crops in a village is shown in the below figure. From that figure, which combination of three crops contributes to 50% of the total area under the food crops?

   A. Wheat, Barley, and Jowar
   B. Rice, Wheat, and Jowar
   C. Rice, Wheat, and Barley
   D. Bajra, Maize, and Rice

3

18. In a class, 30% of the students offered Geophysics, 20% offered Geochemistry and 10% offered both. If a student is selected at random, what is the probability that he has offered Geophysics or Geochemistry?
    A. 3/5
    B. 2/5
    C. 3/4
    D. 3/10

19. Which of the following is not a leap year?
    A. 1600
    B. 2040
    C. 1800
    D. 1840

20. Which of the following is NOT plagiarism?
    A. Verbatim
    B. Paraphrasing
    C. Collusion
    D. Proper Citation

21. In an experiment, a quantity 'P' is measured 10 times, the resulting values are P_1, P_2...P_{10}, whose average is 10. The average of P_1+3, P_2+5, P_3+7, …. $P_{10}+21$ is
    A. 22
    B. 120
    C. 130
    D. 110

22. Sum of the squares of the digits 1 to 9 is
    A. 105
    B. 260
    C. 285
    D. 385

23. When 24 is subtracted from a number, it reduces to its four-seventh. What is the sum of the digits of that number?
    A. 1
    B. 9
    C. 11
    D. Data is inadequate

24. If a 40 m ladder is placed against a 20 m wall such that it just reaches the top of the wall, then the elevation of the wall is equal to
    A. 30°
    B. 60°
    C. 45°
    D. 50°

25. A cylindrical rod of iron whose height is eight times its radius is melted and cast into spherical balls each of half the radius of the cylinder. The number of spherical balls is
    A. 12
    B. 16
    C. 24
    D. 48

26. Based on the given series, 7,11,8,12,9,13, 10,…. what is the next number
    A. 11
    B. 14
    C. 7
    D. 8

27. In an examination, 34% of the students failed in Mathematics and 42% failed in English. If 20 % of the students failed in both subjects, then the percentage of students who passed in both the subjects was
   A. 56
   B. 50
   C. 54
   D. 44

28. The outcome of the expression $\sqrt{4 + \sqrt{15}} + \sqrt{4 - \sqrt{15}} - \sqrt{12 - 4\sqrt{5}}$ is
   A. an irrational number
   B. a negative integer
   C. a natural number
   D. a non-integer rational number

29. 'P' and 'Q' can cover a 200 m race in 22 seconds and 25 seconds, respectively. When 'P' finished the race, then 'Q' is at what distance from the finishing line?
   A. 54 m
   B. 30 m
   C. 48 m
   D. 24 m

30. The measure of the extent to which responses vary from the mean is
   A. The mode
   B. The standard deviation
   C. The variance
   D. The normal distribution

31. The value of $\left[\dfrac{1}{\log^x_{(p/q)}} + \dfrac{1}{\log^x_{(q/r)}} + \dfrac{1}{\log^x_{(r/p)}} \right]$ is
   A. 1
   B. 0
   C. 2
   D. 4

32. Find X

4	27	8
2	1	3
5	30	X

   A. 10
   B. 9
   C. 8
   D. 7

33. Two trains, each 150 m long, moving in opposite directions, cross each other in 15 seconds. If one is moving three times faster than the other, then the speed of the faster train is
   A. 45 km/hr
   B. 60 km/hr
   C. 54 km/hr
   D. 75 km/hr

34. The average temperature for the first four days of a week is 40.2°C and the last four days is 41.3°C. If the average temperature for the whole week is 40.6°C, then the temperature on the fourth day is
   A. 40.8°
   B. 41.3°
   C. 41.8°
   D. 38.5°

35. Which one of the following is called a non-probability sampling?
   A. Systematic sampling
   B. Stratified random sampling
   C. Cluster sampling
   D. Quota sampling

PART-B

36. The Gondwana Supergroup is sub-divided into Permo-carboniferous Lower Gondwana Group, characterized by
   A. Gangomopteris-Glossopteris flora
   B. Dicroidium–Lepidopterisptylophylum flora
   C. All of the above
   D. None of the above

37. Which of the following tectonic feature is not part of the Proterozoic mobile belts of the Indian Sub-continent
   A. Eastern Ghats Mobile Belt
   B. Southern Granulite Terrain
   C. Satpura Fold belt
   D. Indo-Burmese Ranges

38. Trace fossils are also known as
   A. Ichnofossils
   B. Chemical fossils
   C. Pseudo-fossils
   D. All of the above

39. Typical value of speed of sound in sea water
   A. 3×10^8 m/s
   B. 0 m/s
   C. 1500 m/s
   D. 330 m/s

40. Which of the following is not associated with the sedimentary rocks?
   A. bedding
   B. foliation
   C. fossils
   D. all above may be associated with sedimentary rocks

41. The Irvine model refers to the part of phase diagram for a basaltic system with respect to the formation of
    A. Chromitite seams
    B. Banded Iron Formations
    C. Diamond-bearing kimberlite pipes
    D. None of the above

42. The decrease in the radiant intensity traversing a homogeneous extinction medium is in accord with the simple exponential function whose argument is the product of the mass extinction cross section, and the path length is referred to as
    A. Wien's Displacement Law
    B. Stefan-Boltzmann Law
    C. Beer's Law
    D. Kirchoff's Law

43. The acceleration due to gravity at the center of solid spherical earth is
    A. Zero
    B. 9.8 m/sce^2
    C. 4.9 m/sce^2
    D. 1.0 m/sce^2

44. Paired metamorphic belts are evidences of ancient_____ tectonic setting
    A. Rift Zone
    B. Transform Plate boundary
    C. Hotspot
    D. Subduction Zone

45. The largest reservoir of carbon is found in
    A. Atmosphere
    B. Biosphere
    C. Deep Oceans
    D. Land/Ocean sediments

46. Which of the following plume configurations results under stable atmospheric condition?
    A. Fanning
    B. Coning
    C. Looping
    D. None of the above

47. A recumbent fold is one where the axial plane of the fold is
    A. Vertical
    B. Inclined
    C. Horizontal
    D. Curved

48. Porphyry Cu-(Mo) type of ore deposits re associated with which type of rocks?
    A. Basic
    B. Felsic
    C. Intermediate to felsic
    D. Basic to intermediate

49. Magnetic meridian is a
    A. Horizontal plane containing the total magnetic field, its vertical component and declination.
    B. Vertical plane containing the horizontal magnetic field, inclination and declination.
    C. Horizontal plane containing the total magnetic field, and its vertical and horizontal components.
    D. Vertical plane containing the total magnetic field, and its vertical and horizontal components.

50. Which of the following mineral is isotropic under the microscope?
    A. Garnet
    B. Biotite
    C. Muscovite
    D. Quartz

51. If the length of a current carrying wire is doubled its resistivity becomes
    A. Half
    B. Doubled
    C. Remains the same
    D. Becomes 4 times

52. Perthite texture in which thin lamellae of albite occurs within K-feldspar is a result of which process?
    A. Secondary reactions and replacement
    B. Exsolution
    C. Secondary twinning
    D. Polymorphic transformation

53. One of the following has the lowest thermal conductivity
    A. Liquid water
    B. Clay
    C. Dry air at constant pressure
    D. Dry sand

54. For predicting ElNino through numerical models, the following is not important
    A. Ocean heat content
    B. Air-Sea interactions
    C. Walker circulation
    D. Ocean tides

55. Mineralogy of modern shallow water shelf deposits are
    A. Aragonite and High-Mg calcite
    B. Low-Mg calcite
    C. Low-Mg calcite and dolomite
    D. Low-Mg calcite and aragonite

56. In which of the following environments symmetrical ripples found?
   A. Alluvial
   B. Beach
   C. Deep-sea
   D. Desert

57. Which of the following sandstones would have the highest mineralogical maturity?
   A. quartz arenite
   B. arkose
   C. litharenite
   D. All will have similar mineralogical maturity

58. The coastally trapped Kelvin wave in the Bay of Bengal propagates in a direction
   A. Such that coast to its left while propagating
   B. Such that coast to its right while propagating
   C. Propagates perpendicular to the coast
   D. Propagates from east to west

59. Which of the following mineral crystallizes in tetragonal system
   A. Garnet
   B. Orthoclase
   C. Livine
   D. Rutile

60. The sea surface height from satellites is estimated using
   A. Micro-meter
   B. Secattero-meter
   C. Altimeter
   D. Echo-sounder

61. One of the following is the dominant aerosol fluxes in the atmosphere globally
   A. Sea salt
   B. Mineral dust
   C. Volcanic dust
   D. Anthropogenic

62. Which of the following is not a greenhouse gas?
   A. Nitrous Oxide
   B. Ozone
   C. Methane
   D. Nitrogen Dioxide

63. The vertical extent, up to which sunlight can penetrate into Ocean is called
   A. Benthic Zone
   B. Euphotic Zone
   C. Pelagic zone
   D. Thermocline

64. In the ocean the double diffusion occurs due to
        A. Molecular scale processes
        B. meso-scale eddies
        C. Density stratification
        D. Global warming

65. The earth's gravity field decreases
        A. Only with height above the topography
        B. Only with depth below the topography
        C. Both with height and depth with respect to topography
        D. Remains constant

66. The Ganga Basin of India belongs to which category amongst the following?
        A. Piggie-back basin
        B. Peripheral foreland basin
        C. Aulacogen
        D. Passive margin basin

67. Which of the following isotopes is not a radiogenic isotope?
        A. Carbon-13
        B. Carbon-14
        C. Tritium
        D. Sulphur-35

68. In basic rocks, high-pressure granulites are characterized by key mineral association of
        A. Garnet + Plagioclase + Quartz
        B. Garnet + Orthopyroxene + Clinopyroxene + Quartz
        C. Garnet + K-feldspar + Kyanite
        D. Garnet + Clinopyroxene + Plagioclase + Quartz

69. Choose the correct order of distribution of the main types of fault rocks with increasing depth in the crust
        A. Incohesive brittle fault rocks - Cohesive brittle fault rocks – Mylonite – Stripped gneiss
        B. Incohesive brittle fault rocks - Cohesive brittle fault rocks – Stripped gneiss– Mylonite
        C. Mylonite – Stripped gneiss - Incohesive brittle fault rocks - Cohesive brittle fault rocks
        D. Mylonite – Stripped gneiss - Cohesive brittle fault rocks - Incohesive brittle fault rocks

70. From the following identify the densest water-mass in the world oceans
        A. Antarctic Bottom water mass
        B. Antarctic Intermediate water mass
        C. Mediterranean water mass
        D. North Atlantic Deep-water mass

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ENTRANCE EXAMINATION - 2023

Ph.D. - Earth, Ocean and Atmospheric Sciences

Key

Q. No.	Answer	Q. No.	Answer
1	D	36	A
2	B	37	D
3	D	38	A
4	C	39	C
5	A	40	B
6	D All	41	A
7	D	42	C
8	B	43	A
9	C	44	D
10	A	45	D
11	B	46	A
12	A	47	C
13	A	48	C
14	B	49	D
15	A	50	A
16	B	51	C
17	C	52	B
18	B	53	C
19	C	54	D
20	D	55	A
21 All	C All	56	B
22	C	57	A
23	C	58	B
24	A	59	D
25	D	60	C
26	B	61	A
27	D	62	D
28	A	63	B
29	D	64	A
30	B	65	C
31	B	66	B
32	A	67	A
33	C	68	D
34	C	69	A
35	D	70	A

All correct ←

Q-No 6 and 21, benefit to all