Code No. B – 16

Hall Ticket No. | |

University of Hyderabad
ENTRANCE EXAMINATION 2013-2014

M. Sc in Ocean & Atmospheric Sciences

Date/Day: 25.02.2013, Monday
Time: 10.00 - 12.00

Marks:75

Instructions for the candidates:

1. All questions carry equal marks.
2. Write your Hall Ticket Number on the OMR Answer Sheet and in the space provided on the question paper.
3. The question paper consists of Objective Type questions of one mark each. For each question, there are four answers and the answers are to be indicated with capital letters of alphabets viz., A, B, C and D.
4. The question paper consists of Part A and Part B.
5. Answers are to be marked on the OMR answer sheet following the instructions provided there upon.
6. Hand over ~~~~~~~~~~~~~~~~~~~~ the OMR answer sheet at the end of the examination.
7. No additional sheets will be provided. Rough work can be done in the space provided at the end of the booklet.
8. Non-programmable calculators are allowed.

PART - A

1. The radius of the hydrogen atom in its ground state is 0.53 Å. After collision with an electron its radius is found to be unchanged. Its principal quantum number is
   (A)1 (B) 0 (C) 2 (D) n, where n is any positive integer.

2. Dark lines observable in the solar spectrum are caused by the
   (A) scattering of light.
   (B) absence of some elements in the Sun.
   (C) absorption of certain wavelengths by elements present in the Earth's atmosphere.
   (D) absorption of certain wavelengths by elements present in the outer layer of the Sun.

3. If the energy released in one nuclear reaction is 100 MeV, for a 320 kW power plant, the number of nuclei required per second is
   (A)2×10^{16} (B) 4×10^{16} (C) 6.023×10^{23} (D) 10^{16}

4. The resistance of an electrolyte solution in a burette is 1 Ω. If the same solution is poured into another tube of half the diameter, what will be its resistance?
   (A)1 Ω (B) 0.5 Ω (C) 16 Ω (D) 0.0625 Ω

5. If the Earth's gravity were to become half its value, then an object on the surface would lose
   (A) Both weight and mass (B) mass, but not weight.
   (C) weight, but not mass. (D) neither weight nor mass.

6. The shape of the Earth is
   (A) Spherical (B) prolate spheroidal (C) oblate spheroidal (D) elliptical

7. The oceans cover about x% of the surface area of the Earth. The value of x^2 is
   (A) 49% (B) 70% (C) 4900 (D) 0.77

8. The average depth of the oceans is
   (A)6370 km (B) 4000 km (C) 100 km (D) 4 km

9. The salt content of the oceans is about
   (A)I mg/kg (B) 1 g/kg (C) 35 kg/kg (D) 35 g/kg

10. The ocean which has the largest area is the
    (A)Atlantic (B) Pacific (C) Indian (D) Arctic

11. Salt which is the most abundant in the ocean is
    (A)KCl (B) NaCl (C) $CaCO_3$ (D) $MgCO_3$

12. The speed of sound on the sea is x times that in air. The value of x is
    (A)2 (B) < 0 (C)0.5 (D) <5

13. Tsunami never occurs in the
    (A)Coastal area (B) islands (C) deep ocean (D) continental margins

14. The restoring force for the large ocean waves that you see in a beach is
    (A)Gravity (B) buoyancy (C) viscosity (D) surface tension

15. The International Date line falls in the
    (A)Pacific Ocean (B) Atlantic Ocean (C) Indian Ocean (D) Mediterranean

16. When a metal sphere is heated, the percentage increase is minimum for its
    (A)Diameter (B) volume (C) area (D) density

17. Viscosity of a fluid is defined as
    (A) Force per unit length on its surface (C) Force per unit area on its surface
    (B) Internal friction per unit area (D) force per unit area per unit velocity gradient

18. A capillary tube partially immersed in a liquid shows a capillary rise of 0.707 cm. If the same capillary is immerse at an angle of 45°, what will be the capillary rise?
    (A)1 cm (B) 1 cm (C) 2 cm (D) 1.414 cm

19. Two gases of the same pressure, volume and temperature are mixed. If the volume and temperature of the mixture is the same as the previous temperature and volume of each of the gases, what will be the pressure of the mixture?
(A) Same as the original pressure
(B) Twice the original pressure
(C) Thrice the original pressure
(D) Half the original pressure

20. For producing beats, two sources of sound should have the
(A)same amplitude (B)same frequency
(C) widely different amplitudes (D) closely differing frequencies

21. The equation of a stretched string is: $y = 1.0 \sin 2\pi[(t/0.8)-0.01x)]$, where x is in cm and t is in sec. The wavelength of the wave is
(A)100 cm (B) 1 cm (C) 0.01 cm (D) 10 cm

22. Weather phenomena happen in this layer of the atmosphere:
(A)Stratosphere (B) exosphere (C) troposphere (D) tropopause

23. Assuming that the atmospheric pressure is equivalent to 10 m of water column, an air bubble of volume 1cc rising from 90 m depth of water would have a volume of x cc at the surface before breaking. The value of x is:
(A)10 (B) 0.1 (C) 9 cc (D)[1/9]

24. If a cycle wheel of 4 m completes one revolution in 2 seconds, the acceleration of the cycle is
(A)$8\pi^2$ (B) $2\pi^2$ (C)π^2 (D) $4\pi^2$

25. The escape velocity from the Earth
(A) Is directly proportional to the mass of the rocket
(B) Is directly proportional to the square of the mass of the rocket
(C) Is inversely proportional to the square root of the mass of the Earth
(D) Is directly proportional to the square root of the mass of the Earth

PART – B

26. Which of the following bonds has the highest bond enthalpy?
(A)C≡C (B) C=O (C) C≡N (D) N≡N

27. If the first order reaction rate constant is 0.693 hr^{-1}, the half-life of the reaction is
(A)1 hr (B) 693 hr (C) 0.693 hr (D) 0.1 hr

28. Silver chloride dissolves in excess of NH_4OH. The cation present in this solution is
(A)Ag^+ (B) $[Ag(NH_3)_4]^+$ (C) $[Ag(NH_2)_2]$ (D) $[Ag(NH_3)_6]$

29. Which of the following has the lowest metallic conductivity?
(A)Silver (B) sodium (C) copper (D) zinc

30. Which of the following is unaffected by temperature variation?
(A)Molarity (B) normality (C) molality (D) formality

31. The inert form of carbon is
(A)Coal (B) diamond (C) graphite (D) charcoal

32. Bleaching action of SO_2 is due to its
(A)Oxidizing action (B) acidic nature (C) hydrolyzing ability (D) reducing action

33. The effect of repulsion between two lone pairs of electrons present in the oxygen of a water molecule is
(A)Change in the H-O-H bond angle (B) decrease in the H-O-H bond angle
(C) increase in the H-O-H bond angle (D) all atoms will be in one plane

34. Gases exhibit ideal behavior at

(A) low pressures And low temperatures (B) high temperatures and high pressures
(C) high temperatures and low pressures (D) low temperatures and high pressures

35. An isotope of hydrogen has two neutrons and a proton. Its atomic and mass numbers are, respectively,

(A) 1,2 (B) 1,3 (C) 2,1 (D) 2,3

36. Of a number, 30% of 60% of 40% is a gross. What is 25% of the amount?

(A) 2000 (B) 500 (C) 144 (D) 274

37. In a class the average age of 40 students is 20 years. The average age of 25 girls in the class is 19.6 years. What is the average age of the boys in the class?

(A) 20⅓ (B) 19⅔ (C) 21⅗ (D) 20⅔

38. $16\frac{3}{8}-8\frac{7}{8}+17\frac{5}{8}$ =

(A) $25\frac{1}{3}$ (B)$25\frac{1}{8}$ (C) $25\frac{1}{6}$ (D) $24\frac{1}{8}$

39. What will be the area of a semicircle having a perimeter of a cm^2?

(A) $\pi a^2/(2+\pi)^2$ (B) $\pi a^2/(8+4\pi)^2$ (C) $\pi a^2/(4+2\pi)^2$ (D) $\pi a^2/2$

40. B is the brother of C, who is the daughter of D. F is the husband of D. How is B related to F?

(A) son (B) father (C) cousin (D) nephew

41. Govind was doing yoga on one morning in a ground. His mother was coming from the opposite direction, and her shadow was falling exactly behind him. Which direction was Govind facing?

(A) west (B) east (C) north-east (D) south-east

42. Find the missing number x:

1, 16, 81, 256, x, 1296,...

(A)625 (B) 512 (C) 1024 (D) 776

43. Find the missing number y in the following sequence:

-900,-425, 50, 525, 1000, 1475, 1950, y, 2900, ...

(A)2325 (B) 2500 (C) 2275 (D) 2425

44. 60 cows eat 280 kg of hay in 14 days. In how many days will 30 cows eat 120 kg of hay?

(A) 12 days (B) 9 days (C) 7 days (D) days

45. Maldives are located in the

(A) Indian Ocean (B) Arabian Sea (C) Southern Ocean (D) South China Sea

46. 23% of 8040 + 42% of 545 =x% of 3000? Evaluate x.

(A) 56.17 (B) 63.04 (C) 71.04 (D) 69.27

47. Which forms a new compound in air?

(A) H_2O in air (B) N_2 in air (C) O_2 in air (D) phosphorus in air

48. The ratio of specific heats γ for inert gases is

(A) 1.33 (B) 1.66 (C) 2.13 (D) 1.99

49. Which of the following has the highest pH value in water?

(A) $NaHCO_3$ (B) NaCl (C) KCl (D) Na_2CO_3

50. Osmotic pressure in a tree can be increased by

(A) increasing volume (B) increasing temperature
(C) decreasing temperature (D) increasing rainfall

51. What is the entropy change (in J $K^{-1}mol^{-1}$) when 1 mole of ice is converted to water at 0°C, if the enthalpy change is 6 kJ mol^{-1} at 0°C?

(A) 20.13 (B) 2.013 (C) 2.198 (D) 21.98

52. If γ is the ratio of specific heats of a perfect gas, the number of degrees of freedom of a molecule of the gas is

(A) $(25/2)(\gamma-1)$ (B) $(3\gamma-1)/(2\gamma-1)$ (C) $2/(\gamma-1)$ (D) $(9/2)(\gamma-1)$

53. If $x = R \sin(\omega t) + R\omega t$ and $y = R \cos(\omega t) + R$ (where ω and R are constants), what are the x and y components of acceleration when y is a minimum?

(A) 0, $R\omega^2$ (B) $R\omega^2$, 0 (C) 0, $-R\omega^2$ (D) $-R\omega^2$,0

54. Air in a cylinder is suddenly compressed by a piston, which is then maintained at the same position. After some time, the pressure

(A) will increase (B) remains the same (C) will decrease (D) may increase or decrease

55. Which of the following has no dimensions?

(A) strain (B) angular velocity (C) momentum (D) angular momentum

56. The maximum velocity and maximum acceleration of a body executing simple harmonioc motion are respectively, 2 ms^{-1} and 4 ms^{-2}. Its angular velocity is

(A) 1 radian s^{-1} (B) 2 radian s^{-1} (C) 3 radian s^{-1} (D) 4 radian s^{-1}

57. If R is the radius of a planet and g its mean acceleration due to gravity, then, its mean density is given by (taking G as the Universal constant of gravitation)

(A) $3gG/(4\pi R)$ (B) $4\pi gR/(3G)$ (C) $4\pi GR/(3g)$ (D) $3g/(4\pi GR)$

58. If a body falling freely from rest describes distances s_1, s_2 and s_3, respectively, in the first, second and third seconds of its fall, then the ratio $s_1:s_2:s_3$ is

(A) 1:1:1 (B) 1:3:5 (C) 1:2:3 (D) 1: 4: 9

59. A crown made of gold and copper weighs 210 g in air and 198 g in water. The weight of gold in the crown is, taking the densities of gold and copper, respectively, to be 19.3 and 8.5 g m^{-3}, nearly

(A) 93 g (B) 100 g (C) 150 g (D) 193 g

60. For a floating object to be in stable equilibrium, its centre of buoyancy should be

(A) vertically above its centre of gravity (B) vertically below its centre of gravity
(C) horizontally in line with the centre of gravity (D) may be anywhere

61. Due to the rotation of the Earth, each 15° longitude on the Earth represents

(A) one hour (B) half an hour (C) forty five minutes (D) one hour fifteen minutes

62. If PALE is coded as 2134 and Earth as 41590, what should PEARL be coded as?

(A) 29530 (B) 24153 (C) 25413 (D) 25430

63. If all the 26 letters of the English alphabet are written in reverse order, deleting all the vowels, what would be the eighth letter from the right?

(A) L (B) H (C) K (D) J

64. Appu was born on 10th Oct 1970, while Nandi was born 35 days before Appu. If the republic day fell on that year on a Tuesday, on which day Nandi was born?

(A) Monday (B) Tuesday (C) Wednesday (D) Sunday

65. After removing all prime numbers from the integers 1 to 19, how many integers would be left?

(A) 33 (B) 34 (C) 32 (D) 36

66. Raju started at point X and walked 5 km due west, then turned left and walked 10 km straight and again turned left and walked straight 7 km. In which direction is he now from point X?

(A) North east (B) south west (C) South east (D) north west

67. The length of the seconds pendulum is 1 m of the Earth. If the mass and diameter of a planet are double those of the Earth, the length of the seconds pendulum on this planet would be

(A) 1 m (B) 2 m (C) 0.5 m (D) 4 m

68. A jet engine works on the principle of conservation of

(A) linear momentum (B) mass (C) energy (D) angular momentum

69. The Sun appears to be elliptical during sunrise or sunset because of

(A) refraction (B) refraction (C) scattering (D) dispersion

70. If pressure is constant, the rate of diffusion varies proportional --------.

(A) directly to density (B) inversely to density
(C) inversely to square root of density (D) directly to square root of density

71. Evaporation of water is an/a

(A) exothermic change (B) endothermic change (C) isentropic change (D) chemical change

72. What is the next number in the series: 40, 29, 20, 13,?

(A) 8 (B) 5 (C) 6 (D) 11

73. The box product of three position vectors

(A) is always zero (B) represents the volume enclose by the three vectors
(C) represents the total surface area of the solid enclosed by the three vectors
(D) cannot be interpreted unless the vectors are known

74. If the divergence of a vector is zero, then

(A) it has a scalar potential (B) it has a vector potential
(C) it has no potential in general
(D) potential cannot be determined without explicit value of the vector.

75. The vector **V** is the gradient of a scalar φ. The curl of **V** is

(A) zero (B) determinant of φ (C) gradient of φ (D) curl of φ
