BITSAT

Solved Paper 2011

Instructions

1. There are 150 questions in all. The number of questions in each part is as follows

Subjects	**No. of Questions**
Part I (Physics)	1–40
Part II (Chemistry)	41–80
Part III	
(a) English Proficiency	81–95
(b) Logical Reasoning	96–105
Part IV (Mathematics)	106-150

2. All questions are multiple choice questions with four options, only one being correct.
3. Each correct answer fetches 3 marks while incorrect answer fetches –1 mark.

Part I

Physics

1. Suppose the gravitational force varies inversely as the nth power of distance. Then the time period of a planet in circular orbit of radius R around the sun will be proportional to
   (a) $R^{(n+1)/2}$ (b) $R^{(n-1)/2}$
   (c) R^n (d) $R^{(n-2)/2}$
2. Two wires are made of the same material and have the same volume. However wire 1 has cross-sectional area A and wire 2 has cross-sectional area $3A$. If length of wire 1 increased by Δx on applying force F, how much force is needed to stretch wire 2 by the same amount?
   (a) $4F$ (b) $6F$
   (c) $9F$ (d) F
3. The satellite of mass m revolving in a circular orbit of radius r around the earth has kinetic energy E. Then its angular momentum will be
   (a) $\sqrt{\frac{E}{mr^2}}$ (b) $\frac{E}{2mr^2}$
   (c) $\sqrt{2Emr^2}$ (d) $\sqrt{2Emr}$
4. A galvanometer of resistance 100Ω gives full scale deflection with 0.01 A current. How much resistance should be connected in parallel to convert it into an ammeter of range 10 A?
   (a) 0.100Ω (b) 1.00Ω
   (c) 10.00Ω (d) 100.00Ω
5. A car is moving on a circular road of diameter 50 m with a speed of 5 m/s. It is suddenly accelerated at a rate of 1 m/s^2. If the mass of the car is 500 kg, then the net force acting on the car is
   (a) 5 N (b) 1000 N
   (c) $500\sqrt{2}$ N (d) $\frac{500}{\sqrt{2}}$ N

6. Hard X-rays for the study of fractures in bones should have a minimum wavelength of 10^{-11}m. The accelerating voltage for electrons in X-ray machine should be
   (a) <124 kV
   (b) >124 kV
   (c) between 60 kV and 70 kV
   (d) $=100$ kV

7. Natural length of a spring is 60 cm and its spring constant is 4000 N/m. A mass of 20 kg is hung from it. The extension produced in the spring is (Take $g = 9.8\,m/s^2$)
   (a) 4.9 cm (b) 0.49 cm
   (c) 9.4 cm (d) 0.94 cm

8. A point source of light is placed 4 m below the surface of water of refractive index $\frac{5}{3}$. The minimum diameter of a disc, which should be placed over the source, on the surface of water to cut-off all right coming out of water is
   (a) infinite (b) 6 m
   (c) 4 m (d) 3 m

9. What is the maximum acceleration of the particle doing the SHM?
   $y = 2\sin\left[\frac{\pi t}{2} + \phi\right]$, where 2 is in cm
   (a) $\frac{\pi}{2}$ cm/s^2 (b) $\frac{\pi^2}{2}$ cm/s^2
   (c) 10 days (b) 20 days
   (c) 40 days (d) None of these

13. The velocity of efflux of a liquid through an orific in the bottom of the tank does not depend upon
   (a) size of orific
   (b) height of liquid
   (c) acceleration due to gravity
   (d) density of liquid

14. A neutron with velocity v strikes a stationary deuterium atom, its KE changes by a factor of
   (a) $\frac{15}{16}$ (b) $\frac{1}{2}$
   (c) $\frac{2}{1}$ (d) None of these

15. The Poisson's ratio of a material is 0.5. If a force is applied to a wire of this material, there is a decrease in the cross-sectional area by 4%. The percentage increase in the length is
   (a) 1% (b) 2%
   (c) 2.5% (d) 4%

16. Lenz's law of electromagnetic induction corresponds to the
   (a) law of conservation of charge
   (b) law of conservation of energy
   (c) law of conservation of momentum
   (d) law of conservation of angular

19. The force constant of a spring gun is 50 N/m. If a ball of 20 g be shoot by the gun so, that its spring is compressed by 10 cm, the velocity of the ball is

(a) 5 m/s (b) 15 m/s
(c) 25 m/s (d) 20 m/s

20. 1 g of water (volume 1 cm^3) becomes 1671 cm^3 of steam when boiled at a pressure of 1 atm. The latent heat of vapourisation is 540 cal/g, then the external work done is
(1 atm = 1.013×10^5 N/m^2)

(a) 499.7 J (b) 40.3 J
(c) 169.2 J (d) 128.57 J

21. A cube has a side of length 1.2×10^{-2}m. Calculate its volume.

(a) $1.7 \times 10^{-6} m^3$ (b) $1.73 \times 10^{-6} m^3$
(c) $1.70 \times 10^{-6} m^3$ (d) $1.732 \times 10^{-6} m^3$

22. A ball is dropped from height h and another from $2h$. The ratio of time taken by the two balls to reach the ground is

(a) $1 : \sqrt{2}$ (b) $\sqrt{2} : 1$
(c) 2 : 1 (d) 1 : 2

23. The linear momentum p of a body moving in one dimension varies with time t according to the equation $p = a + bt^2$, where a and b are positive constant. The net force acting on the body is

(a) a constant
(b) proportional to t^2
(c) inversely proportional to t
(d) proportional to t

24. Which of the following is not an example of perfectly inelastic collision?

(a) A bullet fired into a block, if bullet gets embedded into block
(b) Capture of an electron by an atom
(c) A man jumping onto a moving boat
(d) A ball bearing striking another ball bearing

25. If a new planet is discovered rotating around sun with the orbital radius double that of the earth, then what will be its time period? (in earth's days)

(a) 1032 (b) 1023
(c) 1024 (d) 1043

26. If density of earth increases 4 times and its radius becomes half of what it is, our weight will

(a) be 4 times its present value
(b) be doubled
(c) remain same
(d) be halved

27. The magnitude of electric field intensity E, such that an electron placed in it would experience an electrical force equal to its weight, is given by

(a) mge (b) $\frac{mg}{e}$
(c) $\frac{e}{mg}$ (d) $\frac{e^2}{m^2}g$

28. The work done in placing a charge of 8×10^{-18} C on a capacitor of capacity 100 μF is

(a) 32×10^{-32} J (b) 16×10^{-32} J
(c) 3.1×10^{-26} J (d) 4×10^{-10} J

29. A steady current flow in a metallic conductor of non-uniform cross-section. The quantity/quantities remaining constant along the whole length of the conductor is/are

(a) current, electric field and drift speed
(b) drift speed only
(c) current and drift speed
(d) current only

30. A galvanometer of 50 Ω resistance has 25 divisions. A current of 4×10^{-4} A gives a deflection of one division. To convert this galvanometer into a voltmeter having a range of 25 V, it should be connected with a resistance of

(a) 2500 Ω as a shunt
(b) 2950 Ω as in shunt
(c) 2550 Ω in series
(d) 2450 Ω in series

31. The cyclotron frequency of an electron gyrating in a magnetic field of 1 T is approximately

(a) 28 MHz
(b) 280 MHz
(c) 2.8 GHz
(d) 28 GHz

32. If **M** is magnetic moment and **B** is the magnetic field, then the torque is given by

(a) $\mathbf{M} \cdot \mathbf{B}$ (b) $\frac{|\mathbf{M}|}{|\mathbf{B}|}$

(c) $\mathbf{M} \times \mathbf{B}$ (d) $|\mathbf{M}||\mathbf{B}|$

33. A coil of inductance L is carrying a steady current I what is the nature of its stored energy?

(a) Magnetic
(b) Electrical
(c) Both magnetic and electrical
(d) Heat

34. Energy conversion in a photoelectric cell takes place from

(a) chemical to electrical
(b) magnetic to electrical
(c) optical to electrical
(d) mechanical to electrical

35. If the ionisation potential of helium atom is 24.6 V, the energy required to ionise it will be

(a) 24.6 eV (b) 24.6 V
(c) 13.6 V (d) 13.6 V

36. Fast neutrons can easily be solved down by

(a) the use of lead shielding
(b) passing them through water
(c) elastic collision with heavy nuclei
(d) applying a strong electric field

37. A film projector magnifies a $100\ cm^2$ film strip on a screen. If the linear magnification is 4, the area of the magnified film on the screen is

(a) $1600\ cm^2$ (b) $400\ cm^2$
(c) $800\ cm^2$ (d) $6400\ cm^2$

38. If v_m is the speed of sound in moist air and v_d is the speed of sound in dry air under identical conditions of pressure and temperature, then

(a) $v_m > v_d$ (b) $v_m < v_d$
(c) $v_m = v_d$ (d) $v_m \cdot v_d = 1$

39. A hot and a cold body are kept in vacuum separated from each other. Which of the following cause decrease in temperature of the hot body?

(a) Radiation
(b) Convection
(c) Conduction
(d) Temperature remains unchanged

40. An ideal refrigerator has a freezer at a temperature of $-13°C$. The coefficient of performance of the engine is 5. The temperature of the air (to which heat is rejected) will be

(a) 325°C (b) 325 K
(c) 39°C (d) 320°C

Part II

Chemistry

41. The mutual heat of neutralisation of 40 g NaOH and 60 g CH_3COOH will be

(a) 57.1 kJ
(b) less than 57.1 kJ
(c) more than 57.1 kJ
(d) 13.7 kJ

42. Which has the smallest size?

(a) Al^{3+} (b) Mg^{2+}
(c) P^{5+} (d) Na^{+}

43. The treatment of benzene with *iso*-butene in the presence of sulphuric acid gives

(a) *iso*-butylbenzene (b) *tert*-butylbenzene
(c) *n*-butylbenzene (d) no reaction

44. Toluene on reaction with N-bromo-succinimide gives

(a) *p*-bromomethylbenzene
(b) *o*-bromomethylbenzene
(c) phenyl bromomethane
(d) *m*-bromomethylbenzene

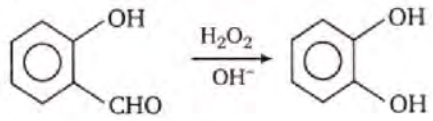
45. Pinacolone is

(a) 2, 3-dimethyl-2, 3-butanediol
(b) 3, 3-dimethyl-2-butanone
(c) 1-phenyl-2-propanone
(d) 1, 1-diphenyl-1, 2-ethandiol

46. A synthetic rubber which is resistant to the action of oils, gasoline and other solvents is

(a) buna-S (b) polyisoprene
(c) neoprene (d) polystyrene

47. Ozone depletion over Antarctica is due to the
(a) formation of chlorine nitrate ($ClONO_2$)
(b) formation of HCl
(c) formation of HOCl and Cl_2 which are converted back into reactive Cl atoms
(d) None of the above

48. 

This reaction is called
(a) Reimer-Tiemann reaction
(b) Liebermann's nitroso reaction
(c) Dakin reaction
(d) Leader-Manase reaction

49. Which anion is the weakest base?
(a) $C_2H_5O^-$ (b) NO_3^-
(c) F^- (d) CH_3COO^-

50. K_b for water is 0.52 K/m. Then 0.1 m solution of NaCl will boil approximately at
(a) 100.52°C (b) 100.052°C
(c) 101.04°C (d) 100.104°C

51. One mole of P_2O_5 undergoes hydrolysis as

$$P_2O_5 + H_2O \longrightarrow H_3PO_4$$

The normality of the phosphoric acid formed is (The volume of solution is 1 L.)
(a) 2 (b) 12
(c) 24 (d) 4

52. 1 L of a gas is at a pressure of 10^{-6} mm of Hg at 25°C. How many molecules are present in the vessel?
(a) 3.2×10^6 (b) 3.2×10^{13}
(c) 3.2×10^{10} (d) 3×10^4

53. Which of the following has the largest de-Broglie wavelength, given that all have equal velocity?
(a) CO_2 molecule (b) NH_3 molecule
(c) Electron (d) Proton

54. 1 g of U–235 is converted into UF_6. The radioactivity of UF_6 thus obtained is
(a) zero
(b) less than that of 1 g of U–235
(c) more than that of 1 g of U–235
(d) same as that of 1 g of U–235

55. In which of the following molecules S atom does not assume sp^3 hybridisation?
(a) SO_4^{2-} (b) SF_4
(c) SF_2 (d) S_8

56. For the reaction,

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

the units of K are
(a) L mol^{-1} (b) L^2 mol^{-2}
(c) mol L^{-1} (d) No units

57. A sulphuric acid solution has pH = 3. Its normality is
(a) 1/1000 (b) 1/200
(c) 1/2000 (d) 1/100

58. The oxidation number of N and Cl in $NOClO_4$ respectively are
(a) + 2 and + 7 (b) + 3 and + 7
(c) – 3 and + 5 (d) + 2 and – 7

59. Pyrolusite is a/an
(a) oxide ore (b) sulphide ore
(c) carbide ore (d) Not an ore

60. When potassium ferrocyanide crystals are heated with conc. H_2SO_4, the gas evolved is
(a) SO_2 (b) NH_3
(c) CO_2 (d) CO

61. The product/s of the reaction,

$$Na_2CO_3 + CO_2 + H_2O \longrightarrow \text{ is/are}$$

(a) $2NaOH + CO_2$ (b) $Na_2CO_3 + H_2CO_3$
(c) $2NaHCO_3$ (d) None of these

62. Which among the following is likely to show geometrical isomerism?
(a) $CH_3CH{=}NOH$
(b) $CH_3CH{=}CH_2$
(c) $CH_2{=}CH{-}CH{=}CCl_2$
(d) $CH_3C(Cl){=}C(CH_3)_2$

63. A fuel has the same knocking property as a mixture of 70% *iso*-octane (2, 2, 4-trimethylpentane) and 30% *n*-heptane by volume. The octane number of the fuel is
(a) 100 (b) 70
(c) 50 (d) 40

64. Sodium carbonate reacts with SO_2 in aqueous medium to give
(a) $NaHSO_3$ (b) $Na_2S_2O_3$
(c) $NaHSO_4$ (d) Na_2SO_4

65. For a given reaction $t_{1/2} = 1/ka$. The order of this reaction is

(a) 0 (b) 1
(c) 2 (d) 3

66. Which of the following compounds will react with two moles of CH_3MgBr?

(a) C_2H_5COOH (b) CH_3COOH
(c) $CH_3C \equiv CCH_3$ (d) $HC \equiv C—CH_2OH$

67. The number of polypeptide chains present in a molecule of haemoglobin is

(a) four (b) one
(c) two (d) three

68. *The pentose sugar in DNA and RNA has the*

(a) open chain structure
(b) pyranose structure
(c) furanose structure
(d) All of the above

69. Which of the following is an artificial edible colour?

(a) Saffron (b) Carotene
(c) Tetrazine (d) Melamine

70. The number of unpaired electrons in nickel carbonyl is

(a) zero (b) one
(c) four (d) five

71. The time taken for 90% of a first order reaction to complete is approximately

(a) 1.1 times that of half-life
(b) 2.2 times that of half-life
(c) 3.3 times that of half-life
(d) 4.4 times that of half-life

72. The pH of a 0.01 M HCN solution for which pK_a is 4 is

(a) 0.47 (b) 1.2
(c) 3.0 (d) 4.0

73. Which of the following does not contain any coordinate bond?

(a) H_3O^+ (b) BF_4^-
(c) HF_2^- (d) NH_4^+

74. If E is the energy of the combining atomic orbitals, E_1 and E_2 are the energies of the bonding and anti-bonding molecular orbitals formed, then

(a) $E - E_1 > E_2 - E$
(b) $E - E_1 < E_2 - E$
(c) $E - E_1 = E_2 - E$
(d) Any one of the above is possible

75. The equilibrium constant (K) for the reaction $Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$

will be [Given, $E^\circ_{cell} = 0.46$ V]

(a) K_c = Antilog 15.6 (b) K_c = Antilog 2.5
(c) K_c = Antilog 1.5 (d) K_c = Antilog 12.2

76. E° for Fe/Fe^{2+} is +0.44 V and E° for Cu/Cu^{2+} is – 0.32 V. Then, in the cell

(a) Cu oxidises Fe^{2+} ion
(b) Cu^{2+} oxidises iron
(c) Cu reduces Fe^{2+} ion
(d) Cu^{2+} ion reduces Fe

77. Which of the following carbon atoms is most electronegative?

$$\overset{III}{CH_3}—\overset{II}{CH_2}—\overset{I}{C}\equiv CH$$

(a) I
(b) II
(c) III
(d) All are equally electronegative

78. The reaction/method that does not give an alkane is

(a) catalytic hydrogenation of alkenes
(b) hydrolysis of alkylmagnesium bromide
(c) Kolbe's electrolytic method
(d) dehydrohalogenation of an alkyl halide

79. Which of the following will yield a mixture of 2-chlorobutene and 3-chlorobutene on treatment with HCl?

(a) $CH_2=C=CH—CH_3$
(b) $H_2C=\underset{\displaystyle CH_3}{\underset{|}{C}}—CH=CH_2$
(c) $CH_2=CH—CH=CH_2$
(d) $HC \equiv C—CH=CH_2$

80. The well known urinary antiseptic urotropine is formed when formaldehyde reacts with

(a) NH_2OH (b) NH_3
(c) $NH_2 \cdot NH_2$ (d) $C_6H_5NH \cdot NH_2$

96. Which one number is wrong in the given series?

5, 10, 17, 24, 37

(a) 10 (b) 17
(c) 24 (d) 37

97. Find the next two letters in the given series.

E F H K O ?

(a) T, Z (b) Z, T
(c) S, Z (d) T, Y

98. If MONKEY is coded as NNOJFX, what will be the code for TARGET?

(a) ZUSFFS (b) SFFSZU
(c) UZSFSF (d) UZSFFS

99. Among six friends L, M, N, P, Q and S, each having a different height, N is shorter than Q and P but taller than M. S is shorter than only L. Which of the following represents the tallest among six friends?

(a) P
(b) Q
(c) L
(d) Cannot be determined

100. Manick is fourteenth from the right end in a row of 40 boys. What is his position from the left end?

(a) 24^{th} (b) 25^{th}
(c) 26^{th} (d) 27^{th}

101. The missing number in the given figure is

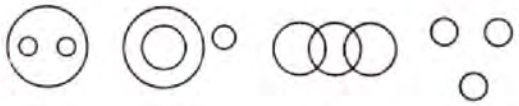
(a) 13 (b) 15
(c) 17 (d) 19

102. Select the combination of numbers so that the letters arranged will form a meaningful word.

H N R C A B
1 2 3 4 5 6

(a) 2, 5, 3, 4, 1, 6 (b) 3, 5, 6, 4, 1, 2
(c) 4, 1, 5, 6, 2, 3 (d) 6, 3, 5, 2, 4, 1

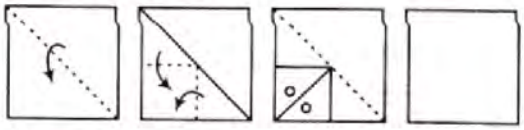
103. Which of the given Venn diagrams out of (a), (b), (c) or (d) correctly represents the relationship among the following classes?
Rose, Flower, Lotus



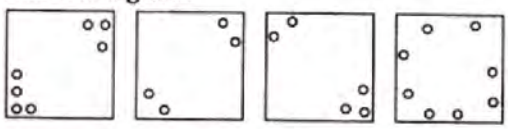
(a) (b) (c) (d)

104. A piece of paper is folded and a cut is made as shown below. From the given responses indicate how it will appear when opened?

Question figures



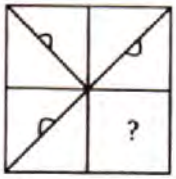
Answer figures



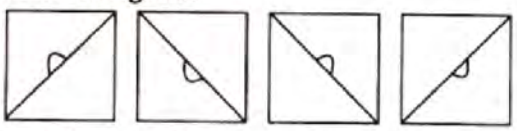
(a) (b) (c) (d)

105. Which answer figure will complete the question figure?

Question figure



Answer figures



(a) (b) (c) (d)

Part IV

Mathematics

106. The equation of the normal to the circle $x^2 + y^2 = a^2$ at point (x', y') will be

(a) $x'y - xy' = 0$ (b) $xx' - yy' = 0$
(c) $x'y + xy' = 0$ (d) $xx' + yy' = 0$

107. Equation of the bisector of the acute angle between lines $3x + 4y + 5 = 0$ and $12x - 5y - 7 = 0$ is

(a) $21x + 77y + 100 = 0$
(b) $99x - 27y + 30 = 0$
(c) $99x + 27y + 30 = 0$
(d) $21x - 77y - 100 = 0$

108. If $z = \cos\theta + i\sin\theta$, then the value of $z^n + \frac{1}{z^n}$ will be

(a) $\sin 2n\theta$ (b) $2\sin n\theta$
(c) $2\cos n\theta$ (d) $\cos 2n\theta$

109. If α and β are the roots of the equation $x^2 - 2x + 4 = 0$, then the value of $\alpha^n + \beta^n$ will be

(a) $i2^{n+1}\sin(n\pi/3)$ (b) $2^{n+1}\cos(n\pi/3)$
(c) $i2^{n-1}\sin(n\pi/3)$ (d) $2^{n-1}\cos(n\pi/3)$

110. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the correct statement is

(a) $A^2 + 5A - 7I = O$
(b) $-A^2 + 5A + 7I = O$
(c) $A^2 - 5A + 7I = O$
(d) $A^2 + 5A + 7I = O$

111. The value of the determinant $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$ will be

(a) $(a-b-c)(a^2+b^2+c^2)$
(b) $(a+b+c)^3$
(c) $(a+b+c)(ab+bc+ca)$
(d) None of the above

112. If $(1+x)^n = C_0 + C_1x + C_2x^2 + \ldots + C_nx^n$, then $C_0 - C_1 + C_2 - C_3 + \ldots + (-1)^n \cdot C_n$ is equal to

(a) 3^n (b) 2^n
(c) 1 (d) 0

113. If AM and HM between two numbers are 27 and 12 respectively, then their GM is

(a) 9 (b) 18
(c) 24 (d) 36

114. For any two events A and B, if $P(A \cup B) = 5/6$, $P(A \cap B) = 1/3$, $P(B) = 1/2$, then $P(A)$ is

(a) 1/2 (b) 2/3
(c) 1/3 (d) None of these

115. A bag contains 3 white and 5 black balls. One ball is drawn at random. Then, the probability that it is white, is

(a) $\frac{1}{8}$ (b) $\frac{3}{8}$
(c) $\frac{5}{8}$ (d) $\frac{3}{5}$

116. $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c}) = 0$, then the correct statement is

(a) out of $\mathbf{a}, \mathbf{b}, \mathbf{c}$ any two vectors are parallel
(b) $\mathbf{a}, \mathbf{b}, \mathbf{c}$ are coplanar
(c) any two are equal $\mathbf{a}, \mathbf{b}, \mathbf{c}$
(d) at least one above statement is correct

117. If $2\mathbf{i} + \mathbf{j} - \mathbf{k}$ and $\mathbf{i} - 4\mathbf{j} + \lambda\mathbf{k}$ are perpendicular to each other, then λ is equal to

(a) -3 (b) -2
(c) -1 (d) 0

118. If $\frac{d}{dx}(\phi(x)) = f(x)$, then $\int_1^2 f(x)\,dx$ is equal to

(a) $f(1) - f(2)$ (b) $\phi(1) - \phi(2)$
(c) $f(2) - f(1)$ (d) $\phi(2) - \phi(1)$

119. $\int_0^2 |1 - x|\,dx$ is equal to

(a) 0 (b) 1
(c) $\frac{3}{2}$ (d) $\frac{1}{2}$

120. $\int \frac{\sin 2x}{\sin^4 x + \cos^4 x}\,dx$ is equal to

(a) $2\tan^{-1}(\tan^2 x) + C$
(b) $\tan^{-1}(x\tan^2 x) + C$
(c) $\tan^{-1}(\tan^2 x) + C$
(d) None of the above

121. The function $\sin x + \cos x$ is maximum when x is equal to

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$

(c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

122. $\frac{d}{dx}(x^x)$ is equal to

(a) $x^x \log(e/x)$ (b) $x^x \log ex$

(c) $\log ex$ (d) $x^x \log x$

123. $\lim_{x \to 0} \frac{\sin x}{x}$ is equal to

(a) 2 (b) -1

(c) 1 (d) 0

124. The set $A = \{x : x \in R, x^2 = 16 \text{ and } 2x = 6\}$ equals

(a) ϕ (b) {14, 3, 4}

(c) {3} (d) {4}

125. In how many ways can 5 prizes be distributed among four students when every student can take one or more prizes?

(a) 1024 (b) 625

(c) 120 (d) 600

126. The value of $(\sqrt{5}+1)^5 - (\sqrt{5}-1)^5$ is

(a) 252 (b) 352

(c) 452 (d) 552

127. The value of $7\log\left(\frac{16}{15}\right) + 5\log\left(\frac{25}{24}\right) + 3\log\left(\frac{81}{80}\right)$ is equal to

(a) log 2 (b) 3

(c) 5 (d) 7

128. The value of $\frac{2}{1!} + \frac{2+4}{2!} + \frac{2+4+6}{3!} + \ldots \infty$ is

(a) e (b) $2e$

(c) $3e$ (d) None of these

129. The sum of the series $\log_4 2 - \log_8 2 + \log_{16} 2 - \ldots$ is

(a) e^2 (b) $\log_e 2$

(c) $\log_e 3 - 2$ (d) $1 - \log_e 2$

130. If the domain of the function $f(x) = x^2 - 6x + 7$ is $(-\infty, \infty)$, then the range of function is

(a) $(-\infty, \infty)$ (b) $[-2, \infty)$

(c) $(-2, 3)$ (d) $(-\infty, -2)$

131. $\lim_{x \to 0} \frac{\cos(\sin x) - 1}{x^2}$ is equal to

(a) 1 (b) -1

(c) $\frac{1}{2}$ (d) $-\frac{1}{2}$

132. In order that the function $f(x) = (x+1)^{1/x}$ is continuous at $x = 0$, $f(0)$ must be defined as

(a) $f(0) = 0$ (b) $f(0) = e$

(c) $f(0) = \frac{1}{e}$ (d) $f(0) = 1$

133. The function $f(x) = |x|$ at $x = 0$ is

(a) continuous but non-differentiable

(b) discontinuous and differentiable

(c) discontinuous and non-differentiable

(d) continuous and differentiable

134. The point (0, 5) is closer to the curve $x^2 = 2y$ at

(a) $(2\sqrt{2}, 0)$ (b) (0, 0)

(c) (2, 2) (d) None of these

135. The function $f(x) = x^{1/x}$ is

(a) increasing in $(1, \infty)$

(b) decreasing in $(1, \infty)$

(c) increasing in $(1, e)$, decreasing in (e, ∞)

(d) decreasing in $(1, e)$, increasing in (e, ∞)

136. The area bounded by the x-axis and the curve $y = \sin x$ and $x = 0$, $x = \pi$ is

(a) 1 sq unit (b) 2 sq units

(c) 0 (d) 4 sq units

137. The order and degree of the differential equation $\sqrt{\frac{dy}{dx}} - 4\frac{dy}{dx} - 7x = 0$ are

(a) 1 and $\frac{1}{2}$ (b) 2 and 1

(c) 1 and 1 (d) 1 and 2

138. The line $x + y = 4$ divides the line joining the points $(-1, 1)$ and $(5, 7)$ in the ratio

(a) 2 : 1 (b) 1 : 2

(c) 1 : 2 externally (d) None of these

139. The angle between the pair of lines given by equation $x^2 + 2xy - y^2 = 0$, is

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$

(c) $\frac{\pi}{2}$ (d) 0

140. The length of tangent from point (5, 1) to the circle $x^2 + y^2 + 6x - 4y - 3 = 0$ is

(a) 81 (b) 29

(c) 7 (d) 21

141. The length of the latusrectum of the parabola $169\{(x-1)^2 + (y-3)^2\} = (5x - 12y + 17)^2$ is

(a) $\frac{14}{13}$ (b) $\frac{12}{13}$

(c) $\frac{28}{13}$ (d) None of these

142. The angle of intersection between the curves $x^2 = 8y$ and $y^2 = 8x$ at (0, 0) is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$

(c) $\frac{\pi}{6}$ (d) $\frac{\pi}{2}$

143. If the centre, one of the foci and semi-major axis of an ellipse be (0, 0), (0, 3) and 5, then its equation is

(a) $\frac{x^2}{16} + \frac{y^2}{25} = 1$ (b) $\frac{x^2}{25} + \frac{y^2}{16} = 1$

(c) $\frac{x^2}{9} + \frac{y^2}{25} = 1$ (d) None of these

144. The radius of the director circle of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

(a) $a - b$ (b) $\sqrt{a-b}$

(c) $\sqrt{a^2 - b^2}$ (d) $\sqrt{a^2 + b^2}$

145. If projection of any line on coordinate axes 3, 4 and 5, then its length is

(a) 12 (b) 50

(c) $5\sqrt{2}$ (d) $3\sqrt{2}$

146. If $\tan\theta = \frac{1}{2}$ and $\tan\phi = \frac{1}{3}$, then the value of $\theta + \phi$ is

(a) $\frac{\pi}{6}$ (b) π

(c) 0 (d) $\frac{\pi}{4}$

147. If $\sin\theta = \frac{1}{2}$, $\tan\theta = \frac{1}{\sqrt{3}}$, $\forall\, n \in I$, then most general values of θ is

(a) $2n\pi + \frac{\pi}{6}, \forall\, n \in I$ (b) $2n\pi + \frac{\pi}{4}, \forall\, n \in I$

(c) $2n\pi + \frac{\pi}{3}, \forall\, n \in I$ (d) $2n\pi + \frac{\pi}{3}, \forall\, n \in I$

148. The principal value of $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ is

(a) $-\frac{2\pi}{3}$ (b) $-\frac{\pi}{3}$

(c) $\frac{4\pi}{3}$ (d) $\frac{5\pi}{3}$

149. A ladder rests against a wall so that its top touches the roof of the house. If the ladder makes an angle of 60° with the horizontal and height of the house be $6\sqrt{3}$ m, then the length of the ladder is

(a) $12\sqrt{3}$ m (b) 12 m

(c) $\frac{12}{\sqrt{3}}$ m (d) None of these

150. If angles A, B and C are in AP, then $\frac{a+c}{b}$ is equal to

(a) $2\sin\left(\frac{A-C}{2}\right)$ (b) $2\cos\left(\frac{A-C}{2}\right)$

(c) $\cos\left(\frac{A-C}{2}\right)$ (d) $\sin\left(\frac{A-C}{2}\right)$