1. If the ground state energy of H-atom is 13.6 eV, the energy required to ionize an H-atom from second excited state is :

A. 1.51 eV B. 3.4 eV C. 13.6 eV D. 12.1 eV

2. The binding energy per nucleon is maximum in case of:

A. $2He^4$ B. $_{26}Fe^{56}$ C. $_{56}Ba^{14}$ D. $_{92}U^{23}$

3. The energy of a photon of wavelength λ is :

A. $hc\lambda$ B. hc/λ C. λ/hc D. $h\lambda/c$

4. Radio waves of constant amplitude can be generated with :

A. rectifier B. filter C. FET D. oscillator

5. Great bear is a

A. Star B. Galaxy C. Constellation D. Planet

6. Monoclinic crystal lattice has dimensions

A. $\alpha = \beta = \gamma$ B. $\alpha = \beta = 90°, \gamma \neq 90°$

C. $\alpha \neq \beta \neq \gamma$ D. None of these

7. Which of the following relations is correct ?

A. $E^2 = pc^2$ B. $E^2 = p^2c$ C. $E^2 = p^2c^2$ D. $E^2 = p^2/c^2$

8. During nuclear disintegration, the following is true

A. mass in conserved B. energy is conserved

C. kinetic Energy is conserved D. momentum is conserved

9. The nucleus forces are

A. charge-dependent B. spin-dependent C. charge-symmetric D. long range

10. During radio-active decay, the negative charged particle is emitted because of

A. X-rays B. β emissions

C. Transmutation of neutron into proton D. None of these

11. Particle in β - decay is

A. Neutron B. Proton C. Electron D. Photon

12. Energy in stars is produced by

A. fusion B. fission C. radioactive decay D. artificial transmutation

13. Atomic packing fraction in *bcc* lattice is

A. $1/\sqrt{\pi}$ B. $\sqrt{\pi}$ C. $\pi/\sqrt{2}$ D. None of these

14. The count of α - particles decreases from 28,800 to 1,800 in 48 hours, the half-life of this radioactive element will be

A. 4 hours B. 8 hours C. 12 hours D. 16 hours

15. Binding energy will be maximum in the case of

A. He^3 B. He^2 C. H^2 D. He^4

16. Binding energy per nucleon in heavy nuclei is of the order of

A. 8 MeV B. 8 eV C. 80 eV D. 80 MeV

17. Complete the series He^6 ---> e + Li^6 + ?

A. nutrino B. anti-nutrino C. proton D. neutron

18. Line spectrum can be obtained from

A. Sun B. Candle C. Mercury Vapour Lamp D. Electric Bulb

19. What is radius of 1st Bohr's orbit in a Hydrogen atom ?

A. 0.53×10^{-10} cm B. 0.53×10^{-8} cm
C. 2.73×10^{-10} cm D. 2.73×10^{-12} cm

20. What is the energy of an electron of Hydrogen in its ground state ?

A. -13.6 eV B. 0 C. infinity D. 13.6 eV

21. What is the rest mass of a photon ?

A. 0 B. 13.6 eV C. 1 MeV D. 3.1×10^{-27} kg

22. Two lenses of powers 12*D* and - 2*D* are placed together, the combined focal length will be

A. 1 cm B. 10 cm C. 100 cm D. 1000 cm

23. The critical angle is maximum when light travels from

A. water to air B. glass to air C. glass to water D. air to water

24. A rider on a horse back falls forward when the horse suddenly stops. This is due to

A. inertia of horse B. inertia of rider
C. large weight of the horse D. losing of the balance

25. Fundamental particle in an electro-magnetic wave is

A. photon B. electron C. phonon D. proton

26. The wavelength is least in case of

A. γ -rays B. X-rays C. infrared D. ultraviolet

27. The speed of electro-magnetic radiation in vacuum is

A. $\mu_0 \varepsilon_0$ B. $\sqrt{(\mu_0 \varepsilon_0)}$ C. $1/\mu_0 \varepsilon_0$ D. $1/\sqrt{(\mu_0 \varepsilon_0)}$

28. Power factor in *LC* oscillations is

A. 0 B. 1 C. 1/4 D. $1/\sqrt{2}$

29. 220 V is changed to 2,200 V through a step-up transformer. Th current in primary is 5 A, what is the current in the secondary ?

A. 5 A B. 50 A C. 0.5 A D. 500 A

30. When a bar is placed near a strong magnet, it is repelled, then the material of the bar is

A. Dimagnetic B. Ferromagnetic
C. Paramagnetic D. Anti-ferrimagnetic

31. Electron enters into a magnetic field at an angle of 60°, its path will be

A. straight line B. circle C. parabola D. helix

32. One electron is moving in electric and magnetic fields, it will gain energy from:

A. electric field B. magnetic field C. both of these D. none of these

33. Force acting on a conductor of length 5 m carrying current 8 amperes kept perpendicular to the magnetic field of 1.5 tesla is

A. 10 N B. 100 N C. 15 N D. 50 N

34. If $E = at - bt^3$, the neutral temperature is

A. -2a/b B. -2b/a C. $\sqrt{(a/3b)}$ D. -b/2a

35. The charge carriers in an electrolyte are

A. negative ions B. positive ions C. both A and B D. none of these

36. When 4 equal resistors are connected in series with a battery and dissipate a power of 10 W, what will be the power dissipated through any of them if it is individually connected across the same battery?

A. 40 W B. 10/3 W C.90W D.10W

37. Cell of emf 1 volt is connected across a potentiometer, balancing length is 600 cm. What will be the balancing length for 2.5 volts ?

A. 400 cm B. 600 cm C. 1500 cm D. 1200 cm

38. A Wire of resistance *R* is stretched to twice its original length, what is its new resistance ?

A. 4 R B. R/9 C. 3 R D. R/3

39. The charge carriers in super-conductors are

A. electrons B. protons

C. phonons D. photons

40. 8 drops of mercury are combined to form a bigger single drop. The capacitance of a single big drop and of the single small drop will be in the ratio

A. 2 : 1 B. 1 : 8 C. 8 : 1 D. 1 : 2

41. A dipole is placed in a uniform electric field, its potential energy will be minimum when the angle between its axis and field is

A. 0 B. π C. $\pi/2$ D. 2π

42. Charge of 2 c is placed at the centre of a cube of volume 8 cc, what is electric flux passing through one face ?

A. $1/(3\varepsilon_0)$ B. $(1/2)\ \varepsilon_0$ C. $2/\varepsilon_0$ D. $3/\varepsilon_0$

43. 1 MeV is

A. 1.6×10^{-19} J B. 1.6×10^{-13} J C. 1.6×10^{-16} J D. 1.6×10^{-9} J

44. Fundamental frequency of a sonometer wire is *n*, if the tension is made 3 times and length and diameter are also increased 3 times, what is the new frequency ?

A. $n/3\sqrt{3}$ B. 3n C. $\sqrt{3}\ n$ D. $3\sqrt{3}\ n$

45. What is the number of beats heard by the driver of a taxi which is approaching a wall at a speed 30 km/hr and emitting a sound of frequency 300 Hz ? Velocity of sound = 330 m/s.

A. 10 B. 15

C. 20 D. 25

46. A person is standing on a railway platform and a train is approaching, what is the maximum wavelength of sound he can hear ? Given wavelength of whistle = 1 m; speed of sound in air = 330 m/s; speed of the train = 36 km/hr.

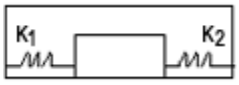
A. 1 m B. 32/33 m C. 33/32 m D. 12/13 m

47. Velocity of sound in open-ended tube is 330 m/s, the frequency of waves is 1.1 kHz and the length of tube = 30 cm, which harmonic will it emit ?

A. 2nd B. 3rd C. 4th D. 5th

48. If both sprong constants K_1 and K_2 are increased to $4K_1$ and K_2 respectively, what will be the new frequency, if *f* was the original frequency?

A. f B. $2f$
C. $(1/2)\,f$ D. $4f$

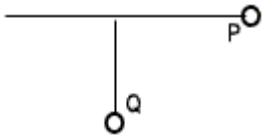


49. The radii of two drops are in the ratio 3 : 2, their terminal velocities are
A. 9 : 4 B. 2 : 3 C. 3 : 2 D. 2 : 9

50. When a body is raised to a height R (which is the radius of earth), the change in its P.E. will be
A. mgR B. $2\,mgR$ C. $mgR/2$ D. $4\,mgR$

51. If the length of a simple pendulum is tripled, what will be its new time period? (T = original time period)
A. $0.7\,T$ B. $1.7\,T$ C. $T/2$ D. T

52. A pendulum of length 2m left at P. When it reaches Q, it looses 10% of its total energy due to air resistance. The velocity at Q is
A. 6m/s B. 1m/s



C. 2m/s D. 8m/s

53. A lift is falling freely under gravity, what is the time period of a pendulum attached to its ceiling ?
A. zero B. infinity C. one second D. two second

54. What is the ratio of the moment of inertia of two rings of radius r and nr respectively about an axis perpendicular to their plane and passing through their centres?
A. $1 : n^2$ B. $1 : n$ C. $1 : 2n$ D. $n^2 : 1$

55. Beta-particle is emitted from the nucleus of mass number A, with velocity V, what is the recoil speed of the nucleus?
A. $M_e\,V/(A - M_e)$ B. $4V/(A + 4)$ C. V D. $V/(A - 4)$

56. If an alpha particle collides head-on with the nucleus, what is the impact parameter ?
A. zero B. infinity C. 10^{-10}m D. 10^{10}m

57. If momentum decreases by 20%, kinetic energy will decrease
A. 40% B. 36% C. 18% D. 8%

58. If two balls are projected at angles 60° and 45° and the total heights reached are same, what is the ratio of their initial velocities ?
A. $\sqrt{3} : \sqrt{2}$ B. $\sqrt{2} : \sqrt{3}$ C. 3 : 2 D. 2 : 3

59. Which one is a vector quantity ?

A. heat B. couple C. energy D. volume

60. Gravel is dropped on to a conveyor belt at a rate of 0.5Kg s^{-2}. The extra force in Newton required to keep the belt moving at 2 ms^{-2} is

A. 1 B. 2 C. 4 D. 5

61. An element with atomic number 20 is

A. an alkali metal B. an alkaline earth metal C. a halogen D. a noble gas

62. When supercooled water suddenly freezes, the free energy of the system

A. increases B. decreases C. remains same D. becomes zero

63. The density of neon is highest at

A. STP B. 0^oC, 2 atm C. 273°C, 1 atm D. 273°C, 2 atm

64. Cadmium in a nuclear reactor acts as

A. nuclear fuel B. neutron absorber

C. a moderator D. neutron liberator to start the chain

65. The end product of 4π series

A. $_{82}Pb^{203}$ B. $_{92}Pb^{207}$ C. $_{82}Pb^{208}$ D. $_{82}Bi^{204}$

66. Haemoglobin is a co-ordination compound in which the central metal atom is

A. iron B. cobalt C. sodium D. manganese

67. The element californium belongs to the family of

A. actinide series B. alkaline earth family C. lanthanide series D. alkali metal family

68. The coloured discharge tube for advertisements contain

A. argon B. xenon C. helium D. neon

69. Which of the following is the strongest base?

A. PH_3 B. AsH_3 C. NH_3 D. SbH_3

70. Canizzaro reaction is not given by

A. Triethylacetaldehyde B. Acetaldehyde C. Benzaldehyde D. Formaldehyde

71. Which of the following statements is not true for alcohols?

A. Lower alcohols have fiery pungent and strong smell

B. As molecular mass increases, boiling point also increases

C. Lower alcohols are water insoluble and their solubility increases with molecular weight

D. Lower alcohols are water insoluble and their solubility decreases with molecular weight

72. Formaldehyde when heated with $CH_3CH_2CH_2MgBr$ gives
A. Primary alcohol B. Secondary alcohol C. Tertiary alcohol D. Acetone

73. A compound of molecular formula C_3H_8O on oxidation gives a compound of formula $C_3H_6O_2$. The original compound is
A. Primary alcohol B. Secondary alcohol C. Aldehyde D. Tertiary alcohol

74. The increasing order of size of F^-, Cl^-, Br^-, I^- is
A. $I^- < Br^- < Cl^- < F^-$ B. $I^- < Cl^- < Br^- < F^-$ C. $F^- < Cl^- < Br^- < I^-$ D. $Br^- < Cl^- < F^- < I^-$

75. Which of the following series contains only nucleophiles?
A. NH_3, H_2O, $AlCl_3$ B. NH_3, ROH, H_2O C. H_2O, H_3O^+, SO_3 D. None of these

76. The formula of acetonitrite is
A. CH_3COCH B. CH_3CN C. CH_3CH_2CN D. CH_3CONH_2

77. The IUPAC name of CH_3CONH_2 is
A. Propionaldehyde B. Acetamide C. Ethanamide D. Ethylamine

78. The rate of reaction increases with temperature because
A. threshold energy increases B. kinetic energy of molecules increases
C. effective collision increases D. none of the above

79. If the graph of concentration of A versus time for completion of reaction is a straight line, then the order of the reaction is
A. zero B. second C. first D. third

80. The decomposition of hydrogen peroxide $2H_2O_2 \rightarrow 2H_2O + O_2$ is
A. zero order reaction B. first order reaction C. second order reaction D. third order reaction

81. The half-life period of a first order process is 1.6 min^{-1}. It will be 90% complete in
A. 0.8 min B. 3.2 min C. 5.3 min D. 1.6 min

82. Which of the following is an electrophile?
A. $AlCl_3$ B. CN^- C. NH_3 D. CH_3OH

83. Molarity of a solution is the number of
A. moles of solute per litre of solution
B. moles of solute per 100 gm of the solution
C. gram molecular weight of solute dissolved per litre of the solution

D. gram equivalents of solute dissolved per litre of solution

84. The hybridisation in PF_3 is

A. sp^3 B. sp^2 C. dsp^3 D. d^2sp^3

85. Which of the following is present in DNA?

A. Deoxyribose B. Starch C. Riboflavin D. None of these

86. Propyne when treated with H_2SO_4 in presence of $HgSO_4$ gives

A. Acetone B. Propionaldehyde C. Acetaldehyde D. Propanoic acid

87. The general formula for alkyne is

A. C_nH_{2n+2} B. CnH_{2n} C. C_nH_{2n-2} D. C_nH_n

88. Mesotartaric acid is optically inactive due to the presence of

A. molecular symmetry B. molecular asymmetry

C. external compensation D. two asymmetric carbon atoms

89. Which of the following electronic configuration in the outermost shell is characteristic of alkali metals?

A. $(n-1)\ s^2p^6ns^2s^1$ B. $(n-l)\ s^2p^6d^{10}ns^1$ C. $(n-l)\ s^2p^6ns^1$ D. $ns^2p^6d^1$

90. Lead chloride is soluble in

A. cold water B. hot water C. HCl D. acetic acid

91. When a copper wire is placed in a solution of silver nitrate, the solution acquires blue colour. This is due to the formation of

A. a soluble complex of copper with $AgNO_3$ B. Cu^+ ions C. Cu^{2+} ions D. Cu^{2+} by reduction of Cu

92. The pyrites are heated with hydrochloric acid. The solution so obtained will give blood red colour with

A. $K_4Fe(CN)_6$ B. KCN C. $K_3Fe(CN)_6$ D. KSNC

93 The ignition mixture in alumino thermite process contains a mixture of

A. magnesium powder and BaO_2 B. magnesium powder, aluminium powder and BaO_2

C. magnesium and aluminium powders D. magnesium and aluminium oxides

94. One of the most important use of quick lime is

A. as a purgative B. drying gases and alcohols C. in bleaching silk D. dyeing cotton

95. In preparing Cl_2 from HCl, MnO_2 acts as a/an

A. dehydrating agent B. reducing agent C. catalytic agent D. oxidising agent

96. Seaweed is an important source of

A. chlorine B. iodine C. fluorine D. bromine

97. Nitrates of all metals are

A. unstable B. stable C. coloured D. soluble

98. Ostwald's method is used for manufacture of

A. HNO_3 B. NO_2 C. NO D. P_2O_5

99. Magnesium reacts with acids producing hydrogen and corresponding magnesium salts. In such reactions, magnesium undergoes

A. oxidation B. reduction

C. neither oxidation nor reduction D. simple dissolution

100. An acidic buffer solution can be prepared by mixing solution of

A. ammonium chloride and HCl B. H_2SO_4 and Na_2SO_4

C. acetic acid and sulphuric acid D. ammonium acetate and acetic acid

101. Which of the following is not a Lewis acid?

A. BF_3 B. $AlCl_3$ C. $SnCl_4$ D. CCl_4

102. Equal weights of methane and oxygen are mixed in an empty container at 25°C. The fraction of total pressure exerted by oxygen is

A. 1/2 B. 1/3 C. 2/3 D. 1/3 x (273/298)

103. HI was heated in a sealed tube at 440^{o}C till the equilibrium was reached. HI was found to be 22% decomposed. The equilibrium constant for dissociation is

A. 0.282 B. 1.99 C. 0.0199 D. 0.0796

104. The molar heat of vaporisation ΔH_{vap} for water is 2079 cal mol $^{-1}$, therefore, molar heat of condensation of water is

A. + 2079 cal mol $^{-1}$ B. - 2079 cal mol $^{-1}$

C. greater than 2079 cal mol $^{-1}$ D. smaller than 2079 cal mol $^{-1}$

105. Which of the following is an insulator?

A. Diamond B. Graphite C. Aluminium D. Silicon

106. The purest coal is

A. Anthracite B. Bituminous C. Peat D. Lignite

107. Among N^{3-}, O^{2-}, F^{-}, and Na^{+}, which one has largest size?
A. N^{3-} B. O^{2-} C. F^{-} D. Na^{+}

108. Ni, Pt, Pd belong to which group of the periodic table?
A. 12th B. 14th C. 8th D. 10th

109. A mixture of 200 ml of dry hydrogen and oxygen in equal proportion at STP is exploded in an audiometer. What will be the nature of components in the audiometer immediately after the explosion?

A. 50 ml of steam only
B. 50 ml of steam and 50 ml of hydrogen
C. 50 ml of steam and 50 ml of oxygen
D. 100 ml of steam and 50 ml of oxygen

110. If 9.8 gm of hexane bums completely in oxygen, how many moles of CO_2 is produced?
A. 6 B. 0.6 C. 0.9 D. 1.2

111. Which one of the following nitrates does not give NO_2 on heating?
A. $NaNO_3$ B. $Pb(NO_3)_2$ C. $AgNO_3$ D. $Cu(NO_3)_2$

112. Which has lowest 1st I.P.?
A. N B. Be C. B D. C

113. The oxidation states of phosphorus vary from
A. - 3 to + 5 B. - 1 to + 1 C. - 3 to + 3 D. - 5 to + 1

114. The molecular velocity of any gas is

A. proportional to the absolute temperature
B. proportional to the square of the absolute temperature
C. proportional to the square root of the absolute temperature
D. independent of the absolute temperature

115. Which of the following is an endothermic reaction?

A. $2H_2 + O_2 \rightarrow 2H_2O$
B. $N_2O_2 \rightarrow 2NO$
C. $2NaOH + H_2SO_4 \rightarrow Na_2SO_4$
D. $C_2H_5OH + 3O_2 \rightarrow 2CO_2 +$

$+2H_2O$ $3H_2O$

116. A solution of sodium sulphate in water is electrolysed between inert electrodes. The product at the cathode and anode are respectively

A. H_2, O_2 B. O_2, H_2 C. H_2, Na D. O_2, SO_2

117. Bauxite mineral containing iron as impurity is purified by

A. Baeyer's process B. Electrolytic process C. Hoope's process D. Serpeck's process

118. Butter of tin is represented by

A. $SnCl_2.3H_2O$ B. $SnCl_2.5H_2O$ C. $SnCl_2.6H_2O$ D. $SnCl_2.8H_2O$

119. Which group activates the benzene ring towards electrophilic substitution?

A. bezo group B. amino group C. acetyl group D. carbyl group

120. Phenol is less acidic than

A. ethanol B. propenol C. p-nitrophenol D. none of the above

121. The lines $3x - 4y + 4 = 0$ and $6x - 8y - 7 = 0$ are tangents of the same circle. The radius of this circle is

A. 1/2 B. 1/4 C. 3/4 D. 2

122. The three dice are thrown simultaneously, then the probability of getting a score of 7 is

A. 1/6 B. 5/216 C. 1/36 D. none of the above

123. Set A has 3 elements and set B has 4 elements. This number of injections (one to one mapping) that can defined from A to B is

A. 24 B. 144 C. 12 D. none of the above

124. If θ is the angle between vectors a and b and $| a \times b | = | a.b |$, then θ is equal to

A. 0^o B. 180^o C. 135^o D. 45^o

125. The number $\log_{20} 3$ lies in

A. (3/4, 4/5) B. (1/3, 1/2) C. (1/2, 3/4) D. (1/4, 1/3)

126. For $x_1, x_2, y_1, y_2 \in R$, if $0 < x_1 < x_2$, $y_1 = y_2$ and $z_1 = x_1 + i\, y_1$, $z_2 = x_2 + i\, y_2$ and $z_3 = 1/2(z_1 + z_2)$, then z_1, z_2, and z_3 satisfy

A. $| z_1 | < | z_3 | < | z_2 |$ B. $| z_1 | > | z_2 | > | z_3 |$ C. $| z_1 | < | z_2 | < | z_3 |$ D. $| z_1 | = | z_2 | = | z_3 |$

127. The complex number which satisfies the equation $z + \sqrt{2} | z + 1 | + i = 0$ is

A. 2 - i B. -2 - i C. 2 + i D. -2 + i

128. The equation of the line with slope -3/2 and which is concurrent with lines $4x + 3y - 7 = 0$ and $8x + 5y - 1 = 0$ is

A. $2y - 3x - 2 = 0$ B. $3x + 2y - 2 = 0$ C. $3x + 2y - 63 = 0$ D. none of the above

129. The parabola $y^2 = 4ax$ passes through the point (2, -6), then the length of its latus rectum is
A. 9 B. 16 C. 18 D. 6

130. The equation of the conic with focus at (1, -1) directrix along $x - y + 1 = 0$ and with eccentricity $\sqrt{2}$ is
A. $xy = 1$ B. $2xy + 4x - 4y - 1 = 0$ C. $x^2 - y^2$ D. $2xy - 4x + 4y + 1 = 0$

131. If the radical axis of the circles $x^2 - y^2 + 2gx + 2fy + c = 0$ and $2x^2 + 2y^2 + 3x + 8y + 2c = 0$ touches the circle $x^2 + y^2 + 2x + 2y + 1 = 0$, then
A. $g = 3/4$ or $f = 2$ B. $g \neq 3/4$ and $f = 2$ C. $g = 3/4$ or $f \neq 2$ D. none of the above

132. If $\tan\theta + \sec\theta = \sqrt{3}$, $\theta < \pi$, then θ is equal to or least positive value of θ is
A. $5\pi/6$ B. $2\pi/3$ C. $\pi/6$ D. $\pi/3$

133. The roots of the equation $4x^2 + 2\sqrt{5}x + 1 = 0$ are
A. $\cos 18^o$, $\cos 36^o$ B. $\sin 18^o$, $\cos 18^o$ C. $\sin 18^o$, $\cos 36^o$ D. $\sin 36^o$, $\sin 18^o$

134. From the bottom of a pole of height h, the angle of elevation of the top of a tower is α. The pole subtends an angle β at the top of a tower. The height of the tower is
A. $[h \sin\alpha \sin(\alpha - \beta)]/\sin\beta$ B. $[h \sin\alpha \cos(\alpha + \beta)]/\cos\beta$ C. $[h \sin\alpha \cos(\alpha - \beta)]/\sin\beta$ D. $[h \sin\alpha \sin(\alpha + \beta)]/\cos\beta$

135. If $\sin(\pi \cos\theta) = \cos(\pi \sin\theta)$, then the value of $\cos(\theta + \pi/4)$ is
A. $2/\sqrt{2}$ B. $1/\sqrt{2}$ C. $-1/\sqrt{2}$ D. $1/2/\sqrt{2}$

136. If $4 \leq x \leq 9$, then
A. $(x - 4)(x - 9) \leq 0$ B. $(x - 4)(x - 9) \geq 0$ C. $(x - 4)(x - 9) < 0$ D. $(x - 4)(x - 9) > 0$

137. The circle $x^2 + y^2 + 4x - 7y + 12 = 0$ cuts an intercept on y-axis equal to
A. 7 B. 4 C. 3 D. 1

138. If α and β are the roots of the equation $x^2 - p(x + 1) - q = 0$, then the value of $[(\alpha^2 + 2\alpha + 1)/(\alpha^2 + 2\alpha v + q)] + [(\beta^2 + 2\beta + 1)/(\beta^2 + 2\beta + q)]$ is
A. 1 B. 0 C. 3 D. 2

139. For $x \in R$, if $mx^2 - 9mx + 5m + 1 > 0$, then m lies in the interval
A. [-61/4, 0] B. [4/61, 61/4] C. [0, 4/61] D. - [-4/61, 0]

140. If a, b, c are positive real numbers, then the number of real roots of the equation $ax^2 + b|x| + c = 0$ is

A. 0 B. 2 C. 4 D. none of the above

141. If $a^x = b^y = c^z$ and a, b, c are in G.P., then x, y, z are

A. G.P. B. A.P. C. H.P. D. none of the above

142. Let cos x = b. For what b do the roots of the equation form an A.P.?

A. $\sqrt{3}/2$ B. 1/2 C. -1 D. none of the above

143. Coefficient of x^4 in the expansion of $(1 - 3x - x^2)/e^x$ is

A. 5/24 B. 4/25 C. 24/25 D. 25/24

144. If C (10, 4) + C (10, 5) = C (11, r), then r equals

A. 6 B. 5 C. 4 D. 3

145. In a steamer, there are stalls for 12 animals and there are cows, horses, and calves (not less than 12 of each) ready to be shipped. The total number of ways in which the shipload can be made is

A. $^{12}C_3$ B. $^{12}P_3$ C. 3^{12} D. 12^3

146. The coefficient of x^n in the binomial expansion of $(1 - x)^{-2}$ is

A. $2^n/2!$ B. n + 1 C. n D. 2n

147. The largest coefficient in the expansion of $(1 + x)^{24}$ is

A. $^{24}C_{13}$ B. $^{24}C_{11}$ C. $^{24}C_{24}$ D. $^{24}C_{12}$

148. The sum of first n terms of two A.P. are 3n + 8, 7n + 15, then the ratio of their 12th term is

A. 7/16 B. 8/15 C. 4/9 D. 3/7

149. If $A = \begin{bmatrix} 12 \\ 21 \end{bmatrix}$, then Adj. A is equal to

A. $\begin{bmatrix} -1 & 2 \\ 2 & -1 \end{bmatrix}$

B. $\begin{bmatrix} 1 & -2 \\ -2 & -1 \end{bmatrix}$

C. $\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 1 & -2 \\ -2 & 1 \end{bmatrix}$

150. If a, b, c are different, then the value of x satisfying the determinant

$$\begin{vmatrix} 0 & x^2 - a & x^3 - b \\ x^2 + a & 0 & x^2 + c \\ x^4 + b & x - c & 0 \end{vmatrix} = 0 \text{ is}$$

A. a B. c C. b D. 0

151. If the system of equations $x = a(y + z)$, $y = b(z + x)$, $z = c(x + y)$ $(a, b, c \neq -1)$ has a non-zero solution, then the value of $[a/(1 + a)] + [b/(1 + b)] + [c/(1 + c)]$ is

A. -1 B. 0 C. 1 D. 2

152. Two lines with direction cosines $< l_1, m_1, n_1 >$ and $< l_2, m_2, n_2 >$ are at right angles if

A. $l_1 l_2 + m_1 m_2 + n_1 n_2 = 1$ B. $l_1 l_2 + m_1 m_2 + n_1 n_2 = 0$

C. $l_1/l_2 = m_1/m_2 = n_1/n_2$ D. $l_1 = l_2, m_1 = m_2, n_1 = n_2$

153. Given the line $L : [(x - 1)/3] = [(y + 1)/2] = [(z - 3)/-1]$ and the plane $\pi : x - 2y = 0$. Of the following assertions, the only one that is always true is

A. L is perpendicular to π B. L lies in π C. L is parallel to π D. none of the above

154. Quartile deviation for a frequency distribution

A. $Q = 1/4 (Q_2 - Q_1)$ B. $Q = 1/3 (Q_3 - Q_1)$ C. $Q = 1/2 (Q_3 - Q_1)$ D. $Q = (Q_3 - Q_1)$

155. For a symmetrical distribution, $Q_1 = 20$ and $Q_3 = 40$. The value of 50th percentile is

A. 20 B. 30 C. 40 D. none of the above

156. The area bounded by the curve $y = x^3$, the x-axis and the ordinates $x = -2$ and $x = 1$ is

A. -9 B. -15/4 C. 15/4 D. 17/4

157. A random variable X has the following probability distribution:

X:	0	1	2	3	4	5	6	7	8
p(X = x):	a	3a	5a	7a	9a	11a	13a	15a	17a

then the value of a is

A. 7/81 B. 5/81 C. 2/81 D. 1/81

158. Dialing a telephone number, an old man forgets the last two digits remembering only that these are different, dialed at random. The probability that the number dialed correctly is

A. 1/90 B. 1/100 C. 1/45 D. none of the above

159. Three identical dice are rolled. The probability that the same number will appear on each of them is

A. 1/18 B. 3/28 C. 1/36 D. 1/6

160. The value of $n \in I$ for which the function $f(x) = \sin nx/[\sin(x/n)]$ has 4π as its period is

A. 5 B. 4 C. 3 D. 2

161. $\lim_{x \to 0} (\log \cos x)/x$ is equal to

A. 0 B. 1 C. ∞ D. none of the above

162. $\lim_{x \to 0} [e^x - (1 + x)]/x^2$ is equal to

A. 1/2 B. 1 C. 0 D. 1/4

163. For the curve $x = t^2 - 1$, $y = t^2 - t$, tangent is parallel to x-axis where

A. $t = 1/\sqrt{3}$ B. $-1/\sqrt{3}$ C. $t = 0$ D. 1/2

164. The function $f(x) = Kx^3 - 9x^2 + 9x + 3$ is monotonically increasing in each interval, then

A. $K > 3$ B. $K < 3$ C. $K \leq 3$ D. none of the above

165. The area of the region bounded by the curve $y = x - x^2$ between $x = 0$ and $x = 1$ is

A. 5/6 B. 1/2 C. 1/3 D. 1/6

166. If $\int_0^1 f(x)\,dx = 1$, $\int_0^1 x\,f(x)\,dx = a$, $\int_0^1 x^2 f(x)\,dx = a^2$, then $\int_0^1 (a - x)^2 f(x)\,dx$ equals

A. $4a^2$ B. 0 C. $2a^2$ D. none of the above

167. The area between the curve $y = 1 - |x|$ and x-axis is

A. 1/3 B. 2 C. 1/2 D. 1

168. The equations $ax + by + c = 0$ and $dx + ey + f = 0$ represents the same straight line if and only if

A. $a/d = b/e$ B. $c = f$ C. $a/d = b/e = c/f$ D. $a = d, b = e, c = f$

169. If $a + b + c = 0$, $|a| = 3$, $|b| = 5$, $|c| = 7$, then the angle between a and b is

A. $\pi/6$ B. $2\pi/3$ C. $5\pi/3$ D. $\pi/3$

170. The differential coefficient of log tan x is

A. $2 \sec^3 2x$ B. $2 \text{cosec}^3 2x$ C. $2 \sec x$ D. $2 \text{cosec } x$

171. The differential coefficient of f(log x) where f(x) = log x is

A. $x/(\log x)$ B. $(\log x)/x$ C. $(x \log x)^{-1}$ D. none of the above

172. The number of solutions of the equation $\tan x + \sec x = 2 \cos x$ lying in the interval $[0, 2\pi]$ is

A. 0 B. 1 C. 2 D. 3

173. In a triangle ABC, the angle B is greater than the angle A. If the values of the angles A and B satisfy the equation $3 \sin x - 4 \sin^3 x - k = 0$, $0 < k < 1$, then the value of C is

A. $\pi/3$ B. $\pi/2$ C. $2\pi/3$ D. $5\pi/6$

174. If one root of $5x^2 + 13x + k = 0$ is reciprocal of the other, then

A. $k = 0$ B. $k = 5$ C. $k = 1/6$ D. $k = 6$

175. The number of quadratic equations, which are unchanged by squaring their roots is

A. 2 B. 4 C. 6 D. none of the above

176. If $x^2 - 3xy + \lambda y^2 + 3x - 5y + 2 = 0$ represents a pair of straight lines, then the value of λ is

A. 1 B. 4 C. 3 D. 2

177. If each element of a determinant of third order with value A is multiplied by 3, then the value of newly formed determinant is

A. 3A B. 9A C. 27A D. none of the above

178. If A, B, and C are non-empty set subsets of the sets, then $(A - B) \cup (B - A)$ equals

A. $(A \cap B) \cup (A \cup B)$ B. $(A \cup B) - (A \cap B)$ C. $A - (A \cap B)$ D. $(A \cup B) - B$

179. A and B are two independent events. The probability that both A and B occur is 1/6 and the probability that neither of them occurs is 1/3. The probability of the occurence of the event A is

A. 2/3 B. 5/6 C. 1/2 D. none of the above

180. The number of divisors of 9600 including 1 and 9600 is

A. 60 B. 58 C. 48 D. 46