1. Surface temperature of the sun is of the order of

A. 5000 K B. 7000 K C. 6000 K D. 12000 K

2. Two bodies A & B having masses in the ratio 1:4 have Kinetic energies in the ratio 4:1.The ratio of the linear momenta is

A. 1:4 B. 1:2 C. 1:1 D. 1:15

3. The function of base in transistor is

A. to stop the flow of electron B. to stop the flow of current

C. to control the flow of current D. to transmit current

4. Unidirectional property of *p-n* junction diode is used in

A. rectifier B. amplifier C. transistor D. oscillator

5. A ^{238}U nucleus decays by emitting an alpha-particle of speed v ms^{-1}. The recoil speed of the residual nucleus is (in ms^{-1})

A. - 4v/234 B. v/4 C. - 4v/238 D. 4v/234

6. Continuous spectrum of X -rays are produced

A. when electrons move from outer to inner orbits B. when electrons move from inner to outer orbits

C. when electrons are accelerated by moving towards the nucleus D. none of these

7. According to Bohr's model of hydrogen atom, the radius of stationary orbits characterised by the principal quantum number is proportional to

A. n^{-1} B. n C. n^{-2} D. n^2

8. When photons of energy 4.25 eV strike the surface of a metal *A*, the ejected photoelectrons have maximum kinetic energy T_A eV and De-Broglie wavelength λ_A. The maximum kinetic energy of the photoelectrons liberated from another metal *B* by photons of energy eV is $T_B = (T_A - 1.5)$ eV. If the De-Broglie wavelength of these photoelectrons is $\lambda_B = 2\lambda_A$, then

A. the work function of A is 3.25 eV B. the work function of B is 4.20 eV

C. T_A=2.00eV D. T_b=2.75eV

9. The magnifying power of simple microscope is

A. $\propto f$ B. $\propto (1/f)$ C.$\propto \sqrt{f}$ D. $\propto (1/\sqrt{f})$

10. Refractive index depends on

A. angle of prism B. wavelength of the light C. intensity of light D. frequency of light

11. A ray is incident in glass at 31°42' on glass-water boundary. If the angle of deviation of the ray is 4.5 degree, the angle of refraction in water will be

A. 27°12' B. 35°92' C. 26°92' D. 36°12'

12. In Young's double slit experiment, the distance between the two slits is 0.1 mm, and the wavelength of light used is 4×10^{-7} m. If the width of the fringe on the screen is 4 mm, the distance between screen and slit is

A. 0.1 mm B. 1 cm C. 0.1 cm D. 1 m

13. The reason of various colours in bubble soap is

A. interference B. visible light C. diffraction D. none of these

14. In a pure inductor circuit, what is the angle between potential and current ?

A. 0 B. π C. $\pi/2$ D. 2π

15. In an LCR circuit, Impedance is minimum when

A. $R = X_L$ B. $R = X_C$ C. $R = X_C + X_L$ D. $R = Z$

16. An LCR series circuit consists of $R = 25\Omega$ and the reactances of C and L are 12Ω and 24Ω respectively. The impedance of the circuit is

A.21Ω B.27.5Ω C. 13Ω D. 5Ω

17. In a transformer there are two coils placed near one another. First has 100 turns and 1A current and the other 25 turns. Current flowing through later will be

A. 1 A B. 4 A C. 16 A D. 1/16 A

18. If two straight long conductors carry current in the same direction, the magnetic force on each other will be

A. repulsive B. attractive C. zero D. none of these

19. If a particle is rotating between two magnetic fields, with certain velocity, this velocity depends upon

A. magnetic field B. angular velocity

C. torque D. acceleration

20. Two infinitely long, thin, insulated, straight wires lie in the x -y plane along the x and y axes respectively. Each wire carries a current I respectively in the positive x-direction and the positive y-direction. The magnetic field will be zero at all points on the straight line

A. y = x B. y = -x C. y = x - 1 D. y = -x + 1

21. Force acting on a charge moving in a magnetic field will not depend upon

A. its mass B. amount of charge

C. its velocity D. intensity of magnetic field

22. 200 W bulb works for 5 minutes, the energy consumed is

A. 70,000 J B. 20,000 J C. 63,000 J D. 60,000 J

23. A 20 volt battery has a capacity of 10^6 joules. How long it can supply a current of 10A ?

A. 5×10^5 sec B. 5×10^3 sec C. 2×10^5 sec D. 2×10^8 sec

24. The calories of heat developed in 200 watt heater in 7 minutes is estimated

A. 15000 B. 100 C. 1000 D. 20000

25. A ball is thrown vertically upwards in free space. Its total mechanical energy

A. remains constant throughout the motion

B. increases during ascent and decreases during descent

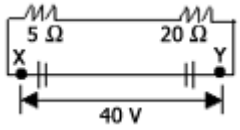
C. is zero at maximum height

D. is equal to kinetic energy at a point just below the maximum height

26. In the circuit shown, the current in the 20 ohms resistor, if the P.D. across *XY* is 50 volts is

A. 0.04 A B. 10 A

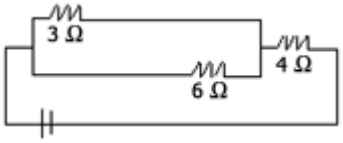
C. 2.5 A D. 1.8 A



27. If current through 3 ohms resistor is 1.2 amp, then potential drop through 4 ohms resistor is

A. 9.6 V B. 2.6 V

C. 2.4 V D. 1.2 V



28. The drift speed of electron in a conductor is of the order of

A. 10^{-3} m/s B. 10^2 m/s C. 10^{-10} m/s D. 10^{+8} m/s

29. What will happen to the capacity of a parallel plate capacitor in which a conductor plate is introduced?

A. Increase B. Decrease C. Remains same D. None of these

30. If charge remains constant, what will happen to the surface potential of a wire whose diameter is doubled but length remains same?

A. Double B. Half C. One-third D. Same

31. A proton is accelerated through a potential difference of 1V. Its energy is

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

32. Electric field intensity on the axis of an electric dipole when (r/a) >> 1, varies as:

A. r B. r^2 C. $1/ r^2$ D. $1/ r^3$

33. A charge Q is divided into two parts q_1 and q_2. The maximum coulomb repulsion between the two parts is obtained when the ratio q_2/q_1 is

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

34. Two bodies *A* and B have thermal emissivities of 0.01 and 0.81 respectively. The outer surface areas of the two bodies are the same. The two bodies emit total radiant power at the same rate. The wavelength λ_B corresponding to maximum spectral radiancy in the radiation differs from that of *A*, by 1.00 μ m. If the temperature of *A* is 5802 K,

A. the temperature of B is 17406 K

B. $\lambda_B = 1.5\mu$ m

C. the temperature of B is 11604 K

D. the temperature of B is 2901 K

35. What will be the temperature when the r.m.s. velocity is double of that at 300 K ?

A. 300 K B. 600 K C. 900 K D. 1200 K

36. If Maxwell distribution is valid and if V_p denotes the most probable speed, V the average speed and V_{rms} the root-mean-square velocity, then

A. $V < V_p < V_{rms}$ B. $V < V_{rms} < V_p$ C. $V_p < V < V_{rms}$ D. $V_p < V_{rms} < V$

37. A cubical box with porous walls containing an equal number of O_2 and H_2 molecules is placed in a large evacuated chamber. The entire system is maintained at a constant temperature *T*. The ratio of the number of O_2 molecules to the number of H_2 molecules found in the chamber outside the box after a short interval, is

A. $1/(2\sqrt{2})$ B. 1 C. $1/\sqrt{2}$ D. $\sqrt{2}$

38. Which of the following is not thermodynamical function?

A. Work done B. Gibb's energy C. Internal energy D. Enthalpy

39. The absolute zero temperature in Fahrenheit scale is

A. -273°F B. -32°F C. -460°F D. -132°F

40. $\lambda_1 = 100$ cm, $\lambda_2 = 90$ cm and velocity = 396 m/s. The number of beats are

A. 41 B. 42 C. 34 D. 44

41. One musical instrument has frequency 90 Hz; velocity of source = 1/10th of the velocity of light. What is the frequency of sound as heard by the observer?

A. 90 Hz B. 10^{-4} Hz C. 900 Hz D. 10^4 Hz

42. Which phenomenon explains the shifting of galaxies from each other?

A. Red shift B. White dwarf C. Black hole D. Neutron star

43. Sound waves in air are always longitudinal because
A. the density of air is very small
B. this is an inherent characteristics of sound waves in all media
C. air does not have a modulus of rigidity
D. air is a mixture of several gases

44. Equation of a progressive wave is given by
$y = \sin \pi \{ (t/5 - x/9) + \pi /6\}$
Then which of the following is correct?

A. V = 5cm/sec B. λ = 18cm C. A = 0.04cm D. f = 50Hz

45. Energy of a particle executing SHM depends upon:

A. amplitude only B. amplitude and frequency C. velocity only D. frequency only

46. Two particles are executing SHMs. The equations of their motion are
$y_1 = 10 \sin (\omega t + \pi T/4)$; $y2 = 25 \sin (\omega t + \sqrt{3}\, \pi T/4)$.
What is the ratio of their amplitudes ?

A. 1 : 1 B. 2 : 5 C. 1 : 2 D. none of these

47: A spherical ball of radius 1×10^{-4} m and of density 10^4 kg/m^3 falls freely under gravity through a distance *h* in a tank of water before attaining the terminal velocity. What will be the value of *h?* (η for water = 9.8×10^{-6} sec/m^2)

A. 18.4m B. 20.4m C. 22.4 m D. 24.4 m

48. Surface tension of a liquid near the critical point

A. is maximum B. is minimum but non-vanishing
C. vanishes D. is maximum but not greater than unity in magnitude

49. The escape velocity of a projectile does not depend upon

A. mass of ball B. radius of earth C. g D. none of these

50. The momentum of the body having kinetic energy E is doubled. The new Kinetic energy is

A. E B. 4E C. 16E D. 32E

51. For a planet moving around the sun in an elipitical orbit of semi-measure and semi-minor axis *a* and *b* respectively and time period *T*, is

A. the average torque acting on the planet about the sun is non zero

B. the angular momentum of the planet about the sun is constant

C.the arial velocity is $\pi ab/T$

D.the planet moves with constant speed around the sun

52. Kepler's law states that square of the time period of any planet about the sun is directly proportional to

A. R B. 1/R C. R^3 D. $1/R^3$

53. Moment of inertia of a body depends upon .

A. Axis of Rotation B. Torque C. Angular Momentum D. Angular Velocity

54. A solid sphere, disc and solid cylinder all of same mass and made up of same material are allowed to roll down (from rest) on an inclined plane, then

A. solid sphere reaches the bottom first

B. solid sphere reaches the bottom late

C. disc will reach the bottom first

D. all of them reach the bottom at the same time

55. A mass *m* with velocity *u* strikes a wall normally and returns with the same speed. What is the change in momentum of the body when it returns:

A. *-mu* B. *mu* C. 2 *mu* D. 0

56. A man can throw a ball to a maximum height of *h.* He can throw the same ball to a maximum horizontal distance of:

A. *h* B. 2*h* C. h^2 D. $2h^2$

57. The velocity with which a projectile must be fired to escape from the earth does depend upon

A. mass of earth B. mass of projectile C. radius of earth D. none of these

58. Which of the following quantities can be written in SI units in $kgm^2A^{-2}s^{-3}$?

A. Resistance B. Inductance C. Capacitance D. Magnetic flux

59. Unit of impulse is

A. ML^2T^{-1} B. $ML^{-2}T^{-2}$ C. $ML^{-1}T$ D. MLT^{-1}

60. $N\text{-}m^2/kg^2$ is unit of

A. torque

B. gravitational constant

C. permittivity

D. surface tension

61. A solution was prepared by mixing 50 ml of 0.2 M HCl and 50 ml of 0.10 M NaOH. The pH of the solution is

A. 7.0 B. 2.0 C. 3.0 D. 1.2

62. Which dye among the following is a vat dye?

A. Martins yellow B. Alizarin C. Indigo D. Malachite green

63. The path of a beam of light through smoke is visible because

A. carbon dioxide in the smoke scatters light B. carbon dioxide in the smoke absorbs light
C. colloidal particles in the smoke absorb light D. colloidal particles in the smoke scatter light

64. Which of the following statements is incorrect?
A. Colloidal particles pass through the pores of filter paper
B. Colloidal particles have large surface area
C. Colloidal particles are charged particles
D. Colloidal particles are neutral

65. The plastic household crockery is prepared using
A. malamine and tetrafluoroethene B. malonic acid and hexamethyleneamine
C. malamine and vinyl acetate D. malamine and formaldehyde

66. An isotope is formed when successive active emissions of an element are
A. α .β , α B. β .β , α C. β .β , β D. α .α , β

67. It is not true that
A. the wavelength associated with an electron is longer than that of proton, if they have the same speed
B. violet radiations have longer wavelength than red radiations
C. the energy of light with λ = 600 Nm is lower than that with λ = 500 Nm
D. spectrum of an atom is known as line spectrum

68. It is true that
A. some complex metal oxides behave as super-conductors
B. zinc oxide can act as a super-conductor
C. an impurity of tetravalent germanium in trivalent gallium creates electron deficient
D. a Frenkel defect is formed when an ion is displaced from its lattice site to an interstitial site

69. Allyl cyanide has
A. 9σ and 4π bonds B. 9σ , 3π and 2 non-bonding electrons
C. 8σ , 3π and 4 non-bonding electrons D. 8σ and 5π bonds

70. The chemical change in the reaction
$CH_2COCH_3 + HCHO \rightarrow CH_2COCH_2CH_2$ is an

example of

A. oxidation reduction B. disproportionation C. aldol addition D. none of the above

71. A fairly specific test for phenol is

A. coupling with diazonium salt B. decolourisation of bromine water

C. dissolution in aqueous alkali D. decolourisation of $KMnO_4$

72. The elevation in the boiling point would be highest for

A. 0.08 M barium chloride B. 0.10 M glucose

C. 0.15 M potassium chloride D. 0.06 M calcium nitrate

73. A 0.2 molal aqueous solution of weak acid (HX) is 20% ionised. The freezing point of this solution is (Given $K_f = 1.86°C\ m^{-1}$ for water)

A. - 0.45°C B. - 0.53°C C. - 0.90°C D. - 0.31°C

74. 6.0 g of urea (molecular weight = 60) was dissolved in 9.9 moles of water. If the vapour pressure of pure water is P_o, the vapour pressure of solution is

A. 0.10 P_o B. 1.10 P_o C. 0.90 P_o D. 0.99 P_o

75. A molecule with the highest bond energy is

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

76. A substance is found to contain 7% nitrogen. The minimum molecular weight of it is

A. 700 B. 100 C. 200 D. 70

77. Sodium nitroprusside when added to an alkaline solution of sulphide ions produces purple coloration due to the formation of

A. Na $[Fe(H_2O)_5NOS]$ B. Na_4 $[Fe(CN)_5NOS]$ C. Na_3 $[Fe(CN)_5NOS]$ D. Na_4 $[Fe(H_2O)_5NOS]$

78. The bond energy (k cal mol^{-1}) of carbon-carbon bond in ethylene is approximately equal to

A. 59 B.100 C. 33 D. 150

79. Which of the following molecule is planar?

A. n-hexane B. glycerine C. cyclohexane D. fumaric acid

80. A mixture of butane, ethylene and dimethyl acetylene is passed through acidified permanganate solution. The gas that comes out is

A. butane B. a mixture of butane and ethylene

C. methyl acetylene D. a mixture of all compounds

81. White lead is

A. $PbCO_3$ B. $Pb(OH)_2$ C. $2PbCO_3Pb(OH)_2$ D. $Pb(CH_3COOO)_2Pb(OH)_2$

82. When tin is boiled with concentrated nitric acid, the compound formed is

A. stannous nitrate B. stannic nitrate C. m-stannic acid D. stannic oxide

83. All the metals form oxides of the type MO except
A. copper B. barium C. silver D. lead

84. The element exhibiting most stable + 2 oxidation state from among the following is
A. Sn B. Fe C. Pb D. Ag

85. German silver is
A. silver made in Germany B. an alloy of silver C. an alloy of copper D. a silvery white paint

86. Aluminium is obtained by
A. heating red bauxite
B. heating alumina with carbon
C. electrolysing a mixture of alumina and cryolite
D. heating alumina in H_2 atmosphere

87. Concentrated H_2SO_4 cannot be used to prepare HBr from NaBr because it
A. reduces HBr B. reacts slowly with NaBr C. oxidises HBr D. disproportionates HBr

88. N_2 is diamagnetic and O_2 is paramagnetic. Both the molecules have even number of electrons (N_2 : 14; O_2 : 16). It is not true that
A. the energy of the two orbitals $\pi_x 2p_x$ and $\pi_x 2p_y$ in O_2 is.the same
B. there are two unpaired electrons in O_2
C. the bond order in N_2 is 3
D. the bond order in O_2 is 3

89. Heavy water
A. contains dissolved Ca^{2+} and Mg^{+} ions
B. contains dissolved Ca^{2+} ions only
C. is made up of ${}_1H^2$ and ${}_8O^{16}$ atoms
D. is water with maximum density at 4^oC

90. It is not true that
A. phosphine is more stable than ammonia
B. phosphorus is less reactive than nitrogen
C. HNO_3 is stronger acid than HPO_3
D. Nitrogen is more electronegative than phosphorus

91. The number of electrons that are paired in an oxygen molecule is
A. 7 B. 14 C. 8 D. 16

92. Which is the correct arrangement of boiling points of the following compounds?

A. $H_2O > H_2Te > H_2Se > H_2S$ B. $H_2O > H_2S > H_2Te > H_2Se$
C. $H_2O < H_2S < H_2Se < H_2Te$ D. $H_2O > H_2S < H_2Se > H_2Te$

93. Amongst the following, the weakest base is

A. potassium hydroxide B. sodium hydroxide C. magnesium hydroxide D. calcium hydroxide

94. The dissociation of water at 25^oC is 1.9×10^{-6} percent and the density of water is 1.0 g cm^{-3}. The ionisation constant of water is

A. 3.42×10^{-6} B. 2.00×10^{-16} C. 3.42×10^{-8} D. 1.00×10^{-14}

95. An aqueous solution contains the following ions: Hg_2^{2+}, Hg^{2+}, Pb^{2+} and Cd^{2+} . It precipitates

A. Hg_2Cl_2 and $PbCl_2$ B. Hg_2C1_2 only C. $PbC1_2$ only D. $PbCl_2$ and $HgCl_2$

96. Which of the following salts is most acidic in water?

A. $NiCl_2$ B. $BeCl_2$ C. $FeCl_3$ D. $AlCl_3$

97. The type of hybridisation in tetrahedral complexes of metal atoms is

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

98. Pick out the electronic configuration of the most electropositive element.

A. ns^2np^3 B. ns^2np^0 C. ns^2np^1 D. ns^2np^4

99. The designation of the orbital with n = 3 and l = 2 is

A. 4d B. 5d C. 3d D. 5s

100. CsBr crystal has bcc structure. It has an edge length of 4.3 A^o. The shortest inter Br-ions is

A. 3.72 A^o B. 4.3 A^o C. 1.86 A^o D. 7.44 A^o

101. A mixture of equal volumes of H_2 and Cl_2 was exposed to ultraviolet light at constant pressure. Pick out the correct statement.

A. The volume of the gas mixture increases by a factor of 2
B. The volume of the gas mixture decreases by a factor of 2
C. The volume remains unchanged, as there is no chemical reaction
D. A chemical reaction occurs but there is no change in volume

102. Correct set of four quantum numbers for the valence electrons of rubidium (z = 37) is

A. 5, 0, 0, + 1/2 B. 5, 1, 0, + 1/2 C. 5, 1, 1, + 1/2 D. 6, 0, 0, + 1/2

103. The linear structure is assumed by

A. $SnCl_2$ B. NCO^- C. SO_2 D. NH_3

104. While P reacts with caustic soda, the products are PH_3 and NaH_2PO_2. This is an example of

A. oxidation B. reduction C. oxidation D. neutralisation

and
reduction

105. Which of the following compounds is covalent?
A. H_2 B. CaO C. KCl D. Na_2S

106. The concentration of solution remains independent of temperature in
A. molarity B. normality C. formality D. molality

107. Precipitation takes place when the product of concentration of ions
A. equals their solubility product B. exceeds their solubility product
C. less than their solubility product D. none of the above

108. Which one of the following elements has maximum electron affinity?
A. F B. Cl C. Br D. I

109. Most probable velocity, average velocity, and RMS velocity are related as
A. 1 : 1.128 : 1.234 B. 1 : 1.234 : 1.128 C. 1.128 : 1 : 1.234 D. 1.128 : 1.234 : 1

110. Which of the following compounds corresponds Vant Hoff's factor (i) to be equal to 2 for dilute solution?
A. K_2SO_4 B. Na_2SO_4 C. Sugar D. $MgSO_4$

111. Amongst the following hydroxides, the one that has the lowest value of K_{sp} at ordinary temperature (about. 25°C) is
A. $Mg(OH)_2$ B. $Ca(OH)_2$ C. $Ba(OH)_2$ D. $Be(OH)_2$

112. The rate of reaction between A and B increases by a factor of 100. When the concentration of A is increased 10 folds, the order of reaction with respect to A is
A. 1 B. 2 C. 3 D. 4

113. In a reversible reaction, a catalyst
A. increases the rate of forward reaction
B. increases the rate of backward reaction
C. alters the rates of both reactions equally
D. increases the rate of forward reaction more than that of backward reaction

114. The cathodic reaction in electrolysis of dil. H_2SO_4 with platinum electrode is
A. oxidation B. reduction
C. both oxidation and reduction D. neutralisation

115. The oxide that gives H_2O_2 on treatment with a dilute acid is
A. PbO_2 B. Na_2O_2 C. MnO_2 D. TiO_2

116. A naturally occurring substance from which a metal can be profitably extracted is called

A. mineral B. gangue C. ore D. flux

117. The metallic lustre exhibited by sodium is explained by
A. diffusion of sodium ion
B. oscillation of loose electrons
C. excitation of free protons
D. existence of body centred cubic lattice

118. A pair of compounds, which cannot exist together in solution, is
A. $NaHCO_3$ and NaOH
B. $NaHCO_3$ and H_2O
C. $NaHCO_3$ and Na_2CO_3
D. Na_2CO_3 and NaOH

119. A solution of sodium metal in liquid ammonia is strongly reducing due to the presence of
A. sodium atoms B. sodium hydride C. sodium amide D. solvated electron

120. If two compounds have the same crystal structure and analogous formulae, they are called
A. allotropes B. isotopes C. isomers D. isobars

121. The line $y = mx + 1$ is a tangent to $y^2 = 4x$, first m equals
A. -1 B. 1 C. 2 D. 4

122. If $Q = \{ x : x = 1/y, \text{ where } y \in N \}$, then
A. $(2/3) \in Q$ B. $2 \in Q$ C. $0 \in Q$ D. $1 \in Q$

123. Which of the following functions is periodic?
A. $f(x) = x - [x]$, where $[x]$ denotes the largest integer less than or equal to the real number x
B. $f(x) = \sin(1/x)$ for $x \neq 0$, $f(0) = 0$
C. $f(x) = x \cos x$
D. none of the above

124. If $| 2x + 5 | \leq x + 3$, then x lies in the interval
A. [5/2, 8/3] B. [- 5/2, - 2] C. [- 8/3, - 2] D. [- 8/3, - 5/2]

125. The centre of a square ABCD is at $z_1 = 0$. The affix of the vertex A is z. Then the affix of the centroid of the triangle ABC is
A. $(z_1/3) [\cos(\pi/2) \pm i \sin(\pi/2)]$
B. $z_1 [\cos(\pi/2) \pm i \sin(\pi/2)]$
C. $(z_1/3) (\cos \pi \pm i \sin \pi)$
D. $z_1 (\cos \pi \pm i \sin \pi)$

126. Angles made with the x-axis by two lines drawn through the point (1, 2) and cutting the line $x + y = 4$ at a distance $(1/3)\sqrt{6}$ from the point (1, 2) are
A. $\pi/12$ and $5\pi/12$ B. $\pi/8$ and $3\pi/8$ C. $\pi/6$ and $\pi/3$ D. none of the above

127. A circle is a limiting case of an ellipse whose eccentricity tends to

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

128. The gradient of one of the lines $x^2 + hxy + 2y^2 = 0$ is twice than that of the other, then h =
A. ± 2 B. ± 3 C. ± 1 D. ± 3/2

129. If the tangent at the point $[4\cos \phi, (16/\sqrt{11}) \sin\phi]$ to the ellipse $16x^{23} + 11y^2 = 256$ is also a tangent to a circle $x^2 + y^2 - 2x = 15$, then the value of ϕ is
A. $\pm \pi/4$ B. $\pm \pi/3$ C. $\pm \pi/6$ D. $\pm \pi/2$

130. If the sides of a triangle are 13, 14, 15, then radius of its in circle is
A. 65/4 B. 67/8 C. 24 D. 4

131. For $n \in Z$, the general solution of the equation $(\sqrt{3} - 1) \sin \theta + (\sqrt{3} + 1) \cos \theta = 2$ is
A. $\theta = n\pi + [(-1)^n (\pi/4)] - (\pi/12)$ B. $\theta = 2n\pi \pm (\pi/4) - (\pi/12)$
C. $\theta = n\pi + [(-1)^n (\pi/4)] + (\pi/12)$ D. $\theta = 2n\pi \pm (\pi/4) + (\pi/12)$

132. The solution of the equation $\cos^2 \theta + \sin^2 \theta + 1 = 0$ lies in the interval
A. $[5\pi/4, 7\pi/4]$ B. $[3\pi/4, 5\pi/4]$ C. $[\pi/4, 3\pi/4]$ D. $[- \pi/4, \pi/4]$

133. The line $2x + y = 3$ cuts the ellipse $4x^2 + y^2 = 5$ at P and Q. If θ be the angle between the normals at these points,then $\tan \theta$ =
A. 3/4 B. 3/5 C. 1/2 D. 5

134. The value of $\sin^2 75^o - \sin^2 15^o$ is
A. 1/2 B. $\sqrt{3}/2$ C. 1 D. 0

135. The number of roots of the equation $[(x + 2)(x + 5)]/[(x - 3)(x + 6)] = (x - 2)/(x + 4)$ is
A. 0 B. 1 C. 2 D. 3

136. If α and β are the roots of $ax^2 + bx + c = 0$, then $1/\alpha$, $1/\beta$ are the roots of
A. $ax^2 + cx + a = 0$ B. $cx^2 + ax + a = 0$ C. $bx^2 + ax + a = 0$ D. $cx^2 + ax + b = 0$

137. If $x^2 - x + 1 = 0$, then the value of x^{3n} is
A. 0 B. -1 C. 1 D. (-1, 1)

138. The next term of the sequence 1, 5, 14, 30, 55, ... is
A. 91 B. 85 C. 90 D. 95

139. In a certain A.P., 5 times the 5th term is equal to 8 times the 8th term, then its 13th term is
A. -13 B. -12 C. -1 D. 0

140. If $x_1, x_2, ..., x_n$ are n non-zero real numbers, such that $[x_1^2 + x_2^2 + ... + (x_{n-1})^2](x_2^2 + x_3^2 +$

.... + x_n^2) ≤ $(x_1x_2 + x_2x_3 + ... + x_{n-1}x_n)^2$ then $x_1, x_2, ..., x_n$ are in

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

141. 2/1! + 4/3! + 6/5! + ... ∞ is equal to

A. e + 1 B. e - 1 C. e^{-1} D. e

142. The maximum number of points into which 4 circles and 4 straight lines intersect is

A. 50 B. 56 C. 26 D. 72

143. Out of 18 points in a plane, no three are in the same straight line except five points which are collinear. The number of straight lines that can be formed joining them is

A. 153 B. 143 C. 144 D. none of the above

144. The sum of the series $\log_4 2, \log_8 2 + \log_{16} 2$ ..... is

A. e^2 B. $\log_e 2 + 1$ C. $\log_e 3 - 2$ D. $1 - \log_e 2$

145. If ω is an imaginary cube root of unity, then $\begin{vmatrix} 2 & 2\omega & -\omega^2 \\ 1 & 1 & 1 \\ 1 & -1 & 0 \end{vmatrix}$ **is equal to**

A. 0 B. -1 C. 1 D. none of the abov

146. The multiplicative inverse of A = $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ **is**

A. $\begin{bmatrix} \cos\theta & \sin\theta \\ \sin\theta & -\cos\theta \end{bmatrix}$

B. $\begin{bmatrix} -\cos\theta & -\sin\theta \\ \sin\theta & -\cos\theta \end{bmatrix}$

C. $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

D. $\begin{bmatrix} -\cos\theta & -\sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

147. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} 11 \\ 33 \end{bmatrix}$ and X be a matrix such that A = BX, then X is equal to

A. 1/2 $\begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$

B. 1/2 $\begin{bmatrix} -2 & 4 \\ 3 & 5 \end{bmatrix}$

C. $\begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$

D. none of the above

148. $\Delta = \begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix}$ **is equal to**

A. $a^2 + b^2 + c^2$ B. ab + bc + ca C. a + b + c D. none of the above

149. Equation of a plane parallel to x-axis is

A. ax + cz + d = 0 B. by + cz + d = 0 C. ax + by + d = 0 D. ax + by + cz + d = 0

150. The angle between the two lines (x - 1)/2 = (y + 3)/2 = (z - 4)/-1 and (x - 4)/1 = (y + 4)/2 = (z + 1)/2 is

A. $\cos^{-1}(2/9)$ B. $\cos^{-1}(4/9)$ C. $\cos^{-1}(1/9)$ D. $\cos^{-1}(3/9)$

151. A car completes the first half of its journey with a velocity v_1 and the rest half with a velocity v_2. Then the average velocity of the car for the whole journey is

A. $(2v_1v_2)/(v_1 + v_2)$ B. $(v_1 + v_2)/2$ C. $v_1 + v_2$ D. none of the above

152. The regression coefficient of y on x is 2/3 and of x on y is 4/3. If the acute angle between the regression lines is θ, then tan θ is equal to

A. 1/9 B. 2/9 C. 1/18 D. none of the above

153. Fifteen coupons are numbered 1 to 15. Seven coupons are selected at random, one at a time with replacement. The probability that the largest number appearing on a selected coupon be 9 is

A. $(3/5)^7$ B. $(1/15)^7$ C. $(8/15)^7$ D. none of the above

154. Two dice are thrown, the probability that the sum of the points on two dice will be 7 is

A. 8/36 B. 7/36 C. 6/36 D. 5/36

155. Four positive integers are taken at random and are multiplied together. Then the probability that the product ends in an odd digit other than 5 is

A. 3/5 B. 609/625 C. 16/625 D. 2/5

156. If ${}^nC_{r-1} = 36$, ${}^nC_r = 84$, and ${}^nC_{r+1} = 126$, then r is equal to

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

157. Lim $(x/\tan^{-1}2x)$ is equal to
$x \to 0$

A. 1/2 B. ∞ C. 0 D. 1

158. Let $f(x) = ax^2 + 1$ for $x > 1$ or $x + a$ for $x \leq 1$, then f derivable ar x = 1 if

A. a = 2 B. a = 1 C. a = 0 D. a = 1/2

159. If $y = \log[(1 - x^2)/(1 + x^2)]$, then dy/dx =

A. $4x^3/(1 - x^4)$ B. $- 4x/(1 - x^4)$ C. $1/(4 - x^4)$ D. $- 4x^3/(1 - x^4)$

160. The smaller value of the polynomial $x^3 - 18x^2 + 96x$ in the interval [0, 9] is

A. 126 B. 135 C. 160 D. 0

161. The equation to the normal to the curve y = sinx at (0, 0) is

A. x - y = 0 B. x + y = 0 C. y = 0 D. x = 0

162. The general solution of the differential equation dy/dx = y/x is

A. log y = kx B. y = kx C. y = k/x D. y = k log x

163. $\int_1^2 \log x \, dx$ **is**

A. log (4/e) B. log (2/e) C. log 4 D. log 2

164. If cos 2B = [cos (A + C)]/[cos (A - C)], then

A. tan A, tan B, tan C are in H.P. B. tan A, tan B, tan C are in A.P. C. tan A, tan B, tan C are in G.P. D. none of the above

165. $\log_3 2$, $\log_6 2$, $\log_{12} 2$ are in

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

166. If the sum of the first n natural numbers is one-fifth of the sum of their squares, then n is

A. 5 B. 6 C. 7 D. 8

167. Sum of coefficients in the expansion of $(x + 2y + z)^{10}$ is

A. 2^{10} B. 3^{10} C. 1 D. none of the above

168. The locus of the point z satisfying the condition arg $[(z - 1)/(z + 1)] = \pi/3$ is

A. a straight line B. a circle C. a parabola D. none of the above

169. $(- 64)^{1/4}$ equals

A. $\pm 2 (1 + i)$ B. $\pm 2 (1 - i)$ C. $\pm 2 (1 \pm i)$ D. none of the above

170. Let $A = \sin^8 \theta + \cos^{14} \theta$, then for all c

A. $A \geq 1$ B. $0 < A \leq 1$ C. $1/2 < A \leq 3/2$ D. none of the above

171. The minimum value of $(3 \cos x + 4 \sin x + 8)$ is

A. 5 B. 9 C. 7 D. 3

172. The sum of the series $1 + 1/2 + 1/2^2 + 1/2^3 + ... \infty$ is equal to

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

173. If $a^x = b$, $b^y = c$, $c^z = a$, then the value of xyz is

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

174. The number $\log_2 7$ is

A. an integer B. a rational number C. an irrational number D. a prime number

175. The function f(x) = 1/x on its domain is

A. increasing B. decreasing C. constant D. information insufficient

176. Out of 800 boys in a school, 224 played cricket, 240 played hockey,and 336 played basketball. Of the total, 64 played both basketball and hockey, 80 played cricket and basketball, 40 played cricket and hockey, and 24 played all the three games. The number of boys who didn't play any game is

A. 160 B. 240 C. 216 D. 128

177. [a b c] is the scalar triple product of three vectors a, b, and c, then [a b c] is equal to

A. [b a c] B. [c b a] C. [b c a] D. [a c b]

178. If $u = a \times (b \times c) + b \times (c \times a) + c \times (b \times a)$, then

A. u is a unit vector B. $u = a + b + c$ C. $u = 0$ D. $u \neq 0$

179. If the cube roots of unity are 1, ω, ω^2, then the roots of equation $(x - 1)^3 + 8 = 0$ are

A. $-1, 1 + 2\omega, 1 + 2\omega^2$ B. $-1, 1 - 2\omega, 1 - 2\omega^2$ C. -1, -1, -1 D. none of the above

180. Let $f : R \to R$, $g : R \to R$ be two functions given by $f(x) = 2x - 3$, $g(x) = x^3 + 5$. Then $(fog)^{-1}(x)$ is equal to

A. $[(x - 7)/2]^{1/3}$ B. $[(x + 7)/2]^{1/3}$ C. $(x - 7/2)^{1/3}$ D. $[(x - 2)/7]^{1/3}$