1. Sun releases energy by the process of

A. nuclear fusion
B. nuclear disintegration
C. nuclear fission
D. spontaneous combustion

2. The number of atoms per unit cell in a *sc*, *bcc,* and *fcc* are

A. 1, 2 and 4 respectively
B. 8, 6 and 10 respectively
C. 1, 4 and 2 respectively
D. 2, 4 and 1 respectively

3. In a diode, at saturation current, the plate resistance is

A. zero
B. constant and finite
C. infinite
D. variable but finite

4. An *n*-type and a *p*-type silicon semi-conductor can be obtained by doping pure silicon with

A. sodium and magnesium respectively
B. phosphorous and boron respectively
C. indium and sodium respectively
D. boron and arsenic respectively

5. When the plate voltage of a triode is 150 V, its cut off voltage is -5 V. On increasing the plate voltage to 200 V, the cut off voltage can be

A. -4.5V
B. -5.0V
C. + 2.3 V
D. -6.06 V

6. In a diode vacuum tube, the plate current is 5 mA when the plate voltage is 160 V. A grid is introduced between the plate and cathode and a voltage of -2 V is applied to it. The plate current then become

A. 20 mA
B. 10 mA
C. 4mA
D. 7.5mA

7. A long spring is stretched by 2cm. Its potential energy is V. If the spring is stretched by 10cm, its potential energy would be

A. V/25
B. V/5
C. 5V
D. 25V

8. The length of a rod as measured by an observer moving with respect to it is half of its proper length. The speed of the observer with respect to rod is

A. 3/2 c ms^{-1}
B. c/2 ms^{-1}
C. $(\sqrt{3})/2\ c\ ms^{-1}$
D. $1/\sqrt{2}\ c\ ms^{-1}$

9. A + μ -meson with a proper half-life of 1.8×10^{-6} s is moving with a speed of 0.9 c with respect to an earth observer. The half-life of this μ -meson according to an observer sitting on it is

A. 1.8×10^{-6} s
B. $1.8 \times \sqrt{0.19} \times 10^{-6}$ s
C. $1.8/\sqrt{0.19} \times 10^{-6}$ s
D. $1.8 \times 0.19 \times 10^{6}$ s

10. The mass per nucleon in an ordinary hydrogen atom is

A. l/l6th mass per nucleon in an oxygen atom

B. slightly greater than the mass per nucleon in an oxygen atom

C. the same as mass per nucleon in an oxygen atom

D. slightly smaller than the mass per nucleon in an oxygen atom

11. Consider the following nuclear reaction

$_2He^4 + {}_ZX^A = {}_{Z+2}Y^{A+3} + W$

What particle does *W* denote ?

A. electron B. positron C. proton D. neutron

12. The function of graphite and the control rods in a nuclear reactor are
A. to produce neutrons and to shield the reactor
B. to slow down the neutrons and to absorb the excess neutrons respectively
C. to absorb the excess neutrons and to shield the reactor respectively
D. to absorb neutrons and to reduce the energy of the neutrons respectively

13. In the first observed nuclear reaction, ${}_7N^{14}$ was bombarded with α -particles. The reaction could be represented as
${}_7N^{14} + {}_2He^4 = X + {}_1H^1$
The element in this reaction is
A. ${}_8O^{17}$ B. ${}_8F^{17}$ C. ${}_8N^{17}$ D. ${}_8Ne^{17}$

14. In a Bucherer's experiment, the specific charge of some β particles is found to be 1/4th of the value determined by J.J. Thomson. The speed of these β particles is
A. $\sqrt{}$ 5/4 c B. $\sqrt{}$ 15/4 c C. 1/4 c D. c

15. When the mass is rotating in a plane about a fixed point, its angular momentum is directed along
A. the radius B. the tangent to orbit
C. line at an angle of 45° to the plane of rotation D. the axis of rotation

16. A photo-cell with a constant p.d. of *V* volts across it, is illuminated by a point source from a distance 25 cm. When the source is moved to a distance of 1 m, the electrons emitted by the photo-cell
A. carry 1/4th their previous energy B. are 1/16th as numerous as before
C. are 1/4th as numerous as before D. carry 1/4th their previous momentum

17. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of combination is
A. -1.5*D* B. -6.5*D* C. 1.5 *D* D. 6.5 *D*

18. A prism splits a beam of white light into its seven constituent colours. This is so because
A. phase of different colour is different B. amplitude of different colours is different
C. energy of different colours is different D. velocity of different colours is different

19. A prism has a refracting angle of 60° when a ray of light is incident on its face at *45°*, it suffers minimum deviation. The angle of minimum deviation is
A. 30° B. 60° C. 45° D. 90°

20. A car driver sees an image of a bus in his driving mirror, which has a radius of curvature of 4 m. The bus which is 10 m long, is parallel

to and following the car in front of the bus 18 m from the mirror. The apparent length of the bus as seen in the mirror is

A. 700 mm B. 670 mm C. 800 cm D. 800 mm

21. A single slit of width d is placed in the path of a beam of wavelength λ . The angular width of principal maximum obtained is

A. d/λ B. λ /d C. $2\lambda /d$ D. $2d/\lambda$

22. A closed tube, partly filled with a liquid & set horizontal, is rotated about a vertical axis passing through its centre. In the process, the moment of inertia of the system about its axis would

A. increase always
B. decrease always
C. remain constant
D. increase if tube is less than half filled, decrease otherwise

23. In an A.C. circuit the instantaneous current through and voltage across a capacitor are represented as $I = I_0 \sin (\omega t + \pi /4)$ and $v = V_0 \sin (\omega t + \pi /8)$ respectively. The current leads the voltage by

A. $\pi /4$ B. $3\pi /8$ C. $\pi /2$ D. $\pi /8$

24. A transformer having 2100 turns in the primary and 4200 turns in the secondary has an a.c. source of 120 V, 10 A connected to its primary. Then the secondary voltage and current are

A. 240 V and 5 A B. 120 V and 10 A C. 240 V and 10 A D. 120 V and 20 A

25. When a magnet falls through a metal ring, acceleration through the metal ring during the free falls is

A. less than g throughout its fall
B. less than g when it is above the ring and more than g when it is below the ring
C. more than g throughout its fall
D. more than g when it is above the ring and less than g when it is below the ring

26. A copper rod is suspended in a non-homogeneous magnetic field region. The rod when in equilibrium, will then align itself

A. in the region where the magnetic field is strongest
B. in the direction in which it was originally suspended
C. in the region where the magnetic field is weakest and parallel to the direction of the magnetic field there
D. none of these

27. The substance which shows permanent magnetism is called

A. anti-ferromagnetic B. paramagnetic C. diamagnetic D. ferromagnetic

28. A magnetic substance is heated to 800 K and then cool down slowly to 300 K, then it

A. retains its magnetism
B. retains its magnetism below curie points

C. does not retain magnetism D. none of these

29. Two heater wires of equal length are first connected in series and then in parallel. The ratio of heat produced in the two cases is

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

30. A galvanometer with a coil resistance of 100Ω gives a full-scale deflection when a current of 1 mA is passed through it. The resistance of the shunt needed to convert this galvanometer into an ammeter 5 of range 10 A is nearly

A. 0.01Ω B. 0.001Ω C. 0.1Ω D. 0.099Ω

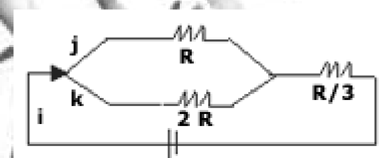
31. The resistance of a 50 cm long wire is 10Ω . The wire is stretched to uniform wire of length 100 cm. The resistance now will be

A. 15Ω B. 30Ω C. 20Ω D. 40Ω

32. In the given circuit, the currents *i*, *j*, and *k* are in the ratio

A. 1:2:3 B. 3:2:1

C. 2:1:3 D. 3:1:2



33. A conducting sphere of radius *R* is given a charge *Q*. Consider three points *B* at the surface, *A* at centre and *C* at a distance *R/2* from the center. The electric potential at these points are such that

A. $V_A = V_B = V_C$ B. $V_A = V_B \neq V_C$ C. $V_A \neq V_B \neq V_C$ D. $V_A \neq V_B = V_C$

34. The mass of a proton is 1847 times that of an electron. An electron and a proton are projected into a uniform electric field in a direction of right angles to the direction of the field with the same initial kinetic energy. Then

A. both the trajectories will be equally curved

B. the proton trajectory will be less curved than the electron trajectory

C. the electron trajectory will be less curved than the proton trajectory

D. the relative curving of the trajectories will be dependent on the value of initial kinetic energy

35. The wavelength of maximum radiation from the moon is 14 x 10^{-6} m. If the value of the constant in Wein's displacement law is 0.00293 mK, the surface temperature of moon is

A. 207 K B. 146 K C. 227 K D. 103.5 K

36. A given mass of gas is subjected to an external pressure of 0.5 x 10^{10} N/m^2. If $K = 10^{10}$Nm^{-2}, the ratio of the density before and after applying the pressure is

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

37. The heat reservoir of an ideal Carnot engine is at 800 K and its sink is at 400 K. The amount of heat taken in it in one second to produce useful mechanical work at the rate of 750 K is

A. 2250 J B. 1125 J C.1500 J D. 750 J

38. A Carnot engine, with its cold body at 17°C has 50% efficiency. If the temperature of its hot body is now increased by 145°C, the efficiency becomes

A. 55% B. 60% C. 40% D. 45%

39. A wire of length 1m increases in length by 10^{-4}m when heated through 10^{2} degree celsius. The coefficient of volume expansion of the wire is

A. 2×10^{-6} B. 1×10^{-6} C. 3×10^{-6} D. 4×10^{-6}

40. The pitch of a sound wave is related to its

A. frequency B. amplitude C. velocity D. beats

41. A mass *m* is hung to a string. After some time, it was observed that mass *m* moves up from its initial position; this is due to

A. decrease in temperature B. increase in temperature C. the statement is wrong D. change in humidity

42. A light spring of force constant 8 Nm^{-1} is cut into two equal halves and the two are connected in parallel; the equivalent force constant of the system is

A. 16 Nm^{-1} B. 32 Nm^{-1} C. 8 Nm^{-1} D. 24 Nm^{-1}

43. A light spring of constant k is cut into two equal parts. The spring constant of each part is

A. k B. $2k$ C. $k/2$ D. $4k$

44. A wave equation which gives the displacement along y-direction is given by $y = 10^{-4} \sin (60t + x)$ where x and y are in meters and t is time in seconds. This represents a wave

A. travelling with a velocity of 300 ms^{-1} in the -ve x-direction

B. of wavelength π meters

C. of frequency $30/\pi$ hertz

D. of amplitude 10^{4} meter travelling along the positive x-direction

45. The periodic times T of a simple pendulum are observed for different length l. If a graph of log T against log l is plotted, the slope of the graph is

A. 2 B. 1/2

C. $\sqrt{2}$ D. $1/\sqrt{2}$

46. Ordinarily, the value of coefficient of restitution varies from

A. 0 to1 B. 0 to 0.5 C. –1 to +1 D. -0.5 to +0.5

47. *In* a gravitational field, if a body is bound with earth, then total mechanical energy it has is

A. *a* +ve value B. a zero value C. a -ve value D. K.E. less than P.E.

48. The mass of a planet is twice the mass of earth and diameter of the planet is thrice the diameter of the earth, then the acceleration due to gravity on the planet's surface is

A. $g/2$ B. $2g$ C. $2g/9$ D. $3g/\sqrt{2}$

49. A stationary bomb explodes into two parts of masses 3 kg and 1 kg. The total K.E. of the two parts after explosion is 2400J. The K.E. of the smaller part is

A 600 J B 1800 J C 1200 J D 2160 J

50. In a perfectly elastic collision

A. both momentum and K.E. are conserved
B. only momentum is conserved
C. only K.E. is conserved
D. neither K.E. nor momentum is conserved

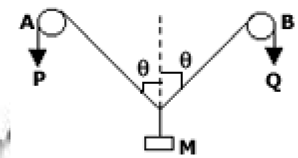
51. A bullet of mass 7g is fired at a velocity of 900 ms^{-1} from a rifle of mass 3.5 kg. What is the recoil velocity of the rifle?

A 0.9 ms^{-1} B 180 ms^{-1} C 900 ms^{-1} D 1.8 ms^{-1}

52. In the arrangement shown in the figure, P and Q are in inflexible strings moving downward with uniform speed U, pulleys A and B are fixed. Mass M move upwards with a speed of

A. 2 U cos θ B. U/cos θ

C. 2U/cos θ D. U cos θ



53. The figure shows the angular velocity-time graph of a flywheel. The angle, in radians, through which the flywheel turns during 25 sec is

A. 75 B 480

C. 615 D. 750

54. A ball is dropped from the top of a building 100m high. At the same instant another ball is thrown upwards with a velocity of 40 ms^{-1} from the bottom of the building. The two balls will meet after

A. 5 sec B. 2.5 sec C. 2 sec D. 3 sec

55. A train accelerating uniformly from rest attains a maximum speed of 40 ms^{-1} in 20 seconds. It travels at this speed for 20 seconds and is brought to rest with uniform retardation in further 40 seconds. What is the average velocity during this period?

A. 80/3 ms^{-1} B. 40 ms^{-1} C. 25 ms^{-1} D. 30 ms^{-1}

56. Two bodies are held and separated by 19.8m vertically one above the other. They are released simultaneously to fall freely under gravity. After 2 seconds, the relative distance between them is:

A. 14.9m B. 19.6m C. 19.8m D. 39.2m

57. A particle starts with a velocity of 2 ms^{-1} and moves in a straight line with a retardation of 0.1 ms^{-2}. The time at which the particle is 1.5 m far from the starting point is

A. 10 sec B. 20 sec C. 30 sec D. 40 sec

58. The units of current in C.G.S. system is

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

59. The units of electric field are

A. volt/metre B. $volt^2$/metre C. volt x metre D. $metre^2$

60. The unit of moment of inertia is

A. kg-m B. kg-m^2 C. kg/m D. kg/m^2

61. Fischer Tropsch process is used for the manufacture of

A. synthetic petrol B. thermosetting plastics C. ethanol D. benzene

62. Brown ring test is used to detect

A. iodide B. nitrate C. iron D. bromide

63. Carbohydrates are used by body mainly

A. for obtaining vitamins B. as source of energy

C. for all its developmental needs D. for building muscles

64. The polymer containing an amide group is

A. Nylon B. Polythene C. Polystyrene D. Terylene

65. The organic compound used as antiknock agent in petroleum is

A. $(C_2H_5)_4Pb$ B. TNT C. CH_3MgBr D. $(C_2H_5)_2Hg$

66. Carbyl amine test is used in the detection of

A. aliphatic 2^o amine B. aromatic 1^o amine

C. aliphatic 1^o amine D. both aliphatic and aromatic 1^o amines

67. Aromatic primary amine when treated with cold HNO_2 gives

A. benzyl alcohol B. nitro benzene C. benzene D. diazonium salt

68. Which of petroleum corresponds to kerosene oil?

A. C_{15} - C_{18} B. C_{10} - C_{12} C. C_5 - C_9 D. C_1 - C_4

69. Aldehydes and ketones can be distinguished by

A. bromoform B. solubility in water C. Tollen's test D. Mollich test

70. Aspirin is obtained by the reaction of CH_3COCl with

A. phenol B. benzoic Acid C. benzaldehyde D. salicylic acid

71. Correct order of the size of iodine species is

A. $I > I^- > I^+$ B. $I^- > I > I^+$ C. $I^+ > I > I^-$ D. $I^- > I^+ > I$

72. Nitrolin is a name given to

A. $CaCN_2 + C$ B. $Ca_3(PO_4)_2$ C. $Ca(CN)_2$ D. $Ca(NO_3)_2$

73. The pair of compound, which cannot exit together, is

A. $NaHCO_3$ and NaOH B. Na_2CO_3 and NaOH C. Na_2CO_3 and $NaHCl_3$ D. $NaHCO_3$ and NaCl

74. One of the constituents of the german silver is

A. Ag B. Cu C. Mg D. Al

75. Which compound is optically active?

A. 4-chloro, l-hydroxy butane B. 3^o butyl alcohol

C. Secondary butyl amine D. n-butyl alcohol

76. Plumbo solvancy implies dissolution of lead in

A. bases B. acids C. ordinary water D. $CuSO_4$ sol

77. Indigo dye belongs to

A. Vat dye B. Mordant dye C. Direct dye D. Ingrain dye

78. Dipole moment is shown by

A. 1, 4-dichloro benzene B. cis, 1, 2-dichloro ethane

C. trans, -1, 2-dichloro, 2-pentene D. trans, -1, 2-dichloro ether

79. When acetylene is passed through H_2SO_4 containing $HgSO_4$, it gives

A. ethyl alcohol B. acetic Acid C. acetaldehyde D. ethylene

80. The compound, which does not leave any residue on heating, is

A. $NaNO_3$ B. NH_4NO_3 C. $CuSO_4$ D. $AgNO_3$

81. Which of the following alloys contain only Cu and Zn?

A. Bronze B. Brass C. Gun metal D. Bell metal

82. Gold number is a measure of the

A. stability of a colloidal system
B. efficiency of a protective colloids
C. coagulating power of colloids
D. size of the colloidal particle

83. Whose name is not associated with the development of Periodic Table?

A. Prout's
B. Newlands
C. Rutherford
D. Loother Meyer

84. Polarisibility of halide ions increases in the order

A. F^-, I^-, Br^-, Cl^-
B. Cl^-, Br^-, I^-, F^-
C. I^-, Br^-, Cl^-, F^-
D. F^-, Cl^-, Br^-, I^-

85. Acetylene molecules contain

A. 5σ bond
B. 4σ bond and 1π bond
C. 3σ and 2π
D. 3σ and 3π

86. The oxidation number of S in $NO_2S_4O_6$ is

A. - 2.5
B. 2.5
C. - 10
D. + 10

87. In ideal gas equation, the dimension of R is

A. mole-atm/K
B. litre/mole
C. litre-atm/K/mole
D. erg/K

88. An element X which occurs in the first short period has an outer electronic structure s^2p^1. What are the formula and acid-base character of its oxides?

A. XO_3, basic
B. X_2O_3, basic
C. X_2O_3, acidic
D. XO_2, acidic

89. The uncertainty in the position of a moving bullet of mass 10 gm is 10^{-5} m. Calculate the uncertainty in its velocity.

A. 5.2×10^{-28} m/sec
B. 3.0×10^{-28} m/sec
C. 5.2×10^{-22} m/sec
D. 3×10^{-22} m/sec

90. Which is not paramagnetic?

A. O_2
B. O_2^+
C. O_2^{2-}
D. O_2^-

91. What is wrongly stated about electrochemical series?

A. It is the representation of element in order of increasing or decreasing standard electrode reduction potential
B. It does not compare the relative reactivity of metals
C. It compares relative strengths of oxidising agents
D. H_2 is centrally placed element

92. Which pairs of ions are isoelectronic?

A. F^- and Cl^-
B. F^- and O^-
C. Na^+ and K^+
D. Na^+ and Mg^{+2}

93. The ionization energy of N_2 is more than that of O_2 because

A. of the extra stability of half filled p-orbitals in N_2
B. of the smaller size of N_2
C. the former contains less number of electrons
D. the former is less electronegative

94. Stainless steel is an alloy of iron with

A. 8% Cr, 5% Mn B. 10% Ni, 2% Mn, C. 2%Cr, 3%C D. 12%Cr, 1%N

95. Highest pH (14) is given by

A. 0.1 M H_2SO_4 B. 0.1 M NaOH C. 1 N NaOH D. 1 N HCl

96. N_2 atom has 3 unpaired electrons, because of

A. Hund's Rule B. Uncertaintity Principle C. Pauli's Exclusion Principle D. Aufbau's Rule

97. A group of atoms can function as a ligand only when

A. it is a small molecule B. it has an unshared electron pair

C. it is a negatively charged ion D. it is positively charged ion

98. When potassium dichromate crystals are heated with conc. HCl,

A. O_2 is evolved B. Chromyl chloride vapours are evolved

C. Cl_2 is evolved D. No reaction takes place

99. Aluminium is more reactive than Fe. But Al is less easily corroded than iron because

A. Al is noble metal B. Fe forms both mono and divalent ions

C. Al forms a protective oxide layer D. Fe undergoes reaction easily with H_2O

100. The ratio of C_v/C_p for inert gas is

A. 1.33 B. 1.66 C. 2.13 D. 1.99

101. The pH of blood is

A. less than 6 B B. greater than 7 and less than 6

C. greater than 8 and less than 9 D. greater than 10

102. Sodium carbonate is manufactured by Solvay process. The recycled products are

A. CO_2 and NH_3 B. CO_2 and NH_4Cl C. NaCl D. $CaC1_2$ and CaO

103. Among the following which is the weakest base?

A. NaOH B. $Ca(OH)_2$ C. KOH D. Zn(OH}$_2$

104. The set of quantum number not applicable for an electron in an atom is

A. n = 1, l = 1, m = 1, S = +1/2 B. n = 1, l = 0, m = 0, S = +1/2

C. n = 1, l = 0, m = 0, S = - 1/2 D. n = 2, l = 0, m = 0, S = +1/2

105. The conversion of A $\rightarrow$ B follows second order kinetics, tripling the concentration of A will increase the rate of formation of B by a factor of

A. 1/4 B. 2 C. 1/2 D. 9

106. Amino group in the benzene group can be protected by
A. arylation B. salfoniation C. chlorination D. acetylation

107. The light radiation with discrete quantities of energy is called
A. electron B. photon C. positron D. meson

108. How many primary amines are possible for the formula $C_4H_{11}N$?
A. 1 B. 2 C. 3 D. 4

109. Base catalysed aldol condensation occurs with
A. propanaldehyde B. benzaldehyde
C. 2, 2-dimethyl propionaldehyde D. none of the above

110. A sample of chloroform before being used as an anaesthetic is tested by
A. Fehling's solution
B. ammonical cuprous chloride
C. silver nitrate solution
D. silver nitrate solution after boiling with alcoholic potassium hydroxide

111. 1-chlorobutane on reaction with alcoholic potash gives
A. 1-butene B. 1-butanol C. 2-butene D. 2-butanol

112. The halogen which is most reactive in the halogenation of alkanes under sunlight is
A. chlorine B. bromine C. iodine D. fluorine

113. The highest b.p. is expected for
A. iso octane B. only ketone C. n-octane D. n-butane

114. The bond between carbon atom (1) and carbon atom (2) in compound $N\equiv C\text{-}CH=CH_2$ involves the hybrids as
A. sp^3 and sp^2 B. sp^3 and sp C. sp and sp^2 D. sp and sp

115. If two compounds have the same empirical formula but different molecular formula, they must have
A. different percentage composition B. different molecular weight
C. same viscosity D. same vapour density

116. Optical isomerism is shown by
A. Butanol-1 B. Butanol-2 C. Butene-1 D. Butene-2

117. The ion that cannot be precipitated by both HCl and H_2S is
A. Pb^{2+} B. Cu^+ C. Ag^+ D. Sn^{2+}

118. The aqueous solution of the following salts will be coloured in case of
A. B. $LiNO_3$ C. D. $ArCl_3$

$Zn(NO_3)_2$ $CO(NO_3)_2$

119. The highest degree of paramagnetism per mole of the compound at 25°C will be shown by

A. $MnSO_4.7H_2O$ B. $COCl_2.6H_2O$ C. $FeCl_3.4H_2O$ D. $NiCl_2.6H_2O$

120. Bromine can be liberated from KBr solution by the action of

A. iodine solution B. chlorine water C. sodium chloride D. potassium iodide

121. If A and B be any two sets, then $(A \cup B)'$ is equal to

A. $A \cap B$ B. $A \cup B$ C. $A' \cap B'$ D. $A' \cup B'$

122. If A = {1, 2, 3, 4}then which of the following are functions from A to itself?

A. $f_4 = \{ (x, y) : x + y = 5 \}$
B. $f_3 = \{ (x, y) : y < x \}$
C. $f_2 = \{ (x, y) : x + y > 4 \}$
D. $f_1 = \{ (x, y) : y = x + 1 \}$

123. The solution of $6 + x - x^2 > 0$ is

A. $-1 < x < 2$ B. $-2 < x < 3$ C. $-2 < x < -1$ D. none of the above

124. If z = x + iy and $\omega = \dfrac{1 - iz}{z - i}$, then $| \omega | = 1$ implies that in the complex plane,

A. z lies on the unit circle
B. z lies on the imaginary axis
C. z lies on the real axis
D. none of the above

125. The first term of a G.P., whose second term is 2 and sum to infinity is 8, will be

A. 6 B. 3 C. 4 D. 1

126. Equation of circle having diameters 2x - 3y = 5 and 3x - 4y = 7, and radius 8 is

A. $x^2 + y^2 - 2x + 2y - 62 = 0$
B. $x^2 + y^2 + 2x + 2y - 2 = 0$
C. $x^2 + y^2 + 2x - 2y + 62 = 0$
D. none of the above

127. A and B are points in the plane such that PA/PB = K (constant) for all P on a circle. The value of K cannot be equal to

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

128. If the centroid and circumcentre of a triangle are (3, 3) and (6, 2) respectively, then the orthocentre is

A. (-3, 5) B. (-3, 1) C. (3, -1) D. (9, 5)

129. If $\sin x + \cos x = 1/5$, $0 \le x \le \pi$, then tan x is equal to

A. - 4/3 or -3/4 B. 4/3 C. 4/5 D. none of the above

130. If r_1, r_2, r_3 in a triangle be in H.P., then the sides are in

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

131. cot θ = sin 2θ (θ ≠ nπ, n integer) if θ equals

A. 45^o and 90^o B. 45^o and 60^o C. 90^o only D. 45^o

132. If a = (b - c) sec θ, then $\frac{2\sqrt{bc}}{b - c} \sin \frac{A}{2}$ =

A. cos θ B. cot θ C. tan θ D. sin θ

133. The average of n numbers x_1, x_2, x_3, ..., x_n is M. If x_n is replaced by x', then new average is

A. $\frac{M - x_n + x'}{n}$ B. $\frac{(n - 1)M + x'}{n}$

C. $\frac{nM - x_n + x'}{n}$ D. $M - x_n + x'$

134. In an entrance test, there are multiple choice questions. There are four possible answers to each question of which one is correct. The probability that a student knows the answer to a question is 90%. If he gets the correct answer to a question, then the probability that he was guessing is

A. 1/9 B. 36/37 C. 1/37 D. 47/40

135. The value of tan [$\cos^{-1}$ (4/5) + $\tan^{-1}$ (2/3)] is

A. 16/7 B. 6/17 C. 7/16 D. none of the above

136. $\lim_{x \to k^-}$ x - [x] , where k is an integer, is equal to

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

137. The values of x where the function f (x) = $\frac{\tan x [\log (x - 2)]}{\quad}$ is discontinuous are given by

$x^2 - 4x + 3$

A. $(-\infty, 2) \cup \{3, n\pi, n \geq 1\}$
B. $(-\infty, 2)$
C. $(-\infty, 2) \cup \{2n\pi, \pi/2, n = 1\}$
D. none of the above

138. If $y = x + e^x$, then $\frac{d^2x}{dy^2}$ is

A. $\frac{1}{(1 + e^x)^2}$
B. $-\frac{e^x}{(1 + e^x)^2}$
C. $-\frac{e^x}{(1 + e^x)^3}$
D. e^x

139. At $x = 5\pi/6$, $f(x) = 2 \sin 3x + 3 \cos 3x$ is
A. zero
B. maximum
C. minimum
D. none of the above

140. If $a < 0$, the function $(e^{ax} + e^{-ax})$ is a strictly monotonically decreasing function for values of x is given by
A. $x < 1$
B. $x > 1$
C. $x < 0$
D. $x > 0$

141. $\int [\sin (\log x) + \cos (\log x)]\, dx$ is equal to
A. $\sin (\log x) + \cos (\log x) + c$
B. $\sin (\log x) + c$
C. $x \cos (\log x) + c$
D. none of the above

142. $\int_{-1/2}^{1/2} | x \cos \pi/2\, x |\, dx$ is

A. 0
B. 1
C. $(\pi\sqrt{2} + 4\sqrt{2} - 8)/\pi^2$
D. none of the above

143. Solution of differential equation $xdy - ydx = 0$ represents
A. parabola whose vertex is at origin
B. circle whose centre is at origin
C. a rectangular hyperbola
D. straight line passing through origin

144. If $h(x) = f(x) + f(-x)$, then $h(x)$ has got an extreme value at a point where $f '(x)$ is
A. even function
B. odd function
C. zero
D. none of the above

145. If $x = 1/3$, then the greatest term in the expansion of $(1 + 4x)^8$ is
A. 3rd term
B. 6th term
C. 5th term
D. 4th term

146. Roots of $x^2 + k = 0$, $k < 0$ are

A. real and equal B. rational C. real and distinct D. equal

147. In a quadratic equation with leading coefficient 1, a student reads the coefficient 16 of x strongly as 19 and obtains the roots as -15 and - 4. The correct roots are

A. 8, 8 B. 6, 10 C. - 6, - 10i D. - 8, - 8

148. The value of m for which the equation $x^2 - mx^2 + 3x - 2 = 0$ has two roots equal in magnitude but opposite in sign is

A. 4/5 B. 3/4 C. 2/3 D. 1/2

149. If 1/(b-a) + 1/(b-c) = 1/a + 1/c, then a, b, c are in

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

150. If every term in G.P. is positive and also every term in the sum of two proceeding terms, then the common ratio of the G.P. is

A. $(1 - \sqrt{5})/2$ B. $(\sqrt{5} +1)/2$ C. $(\sqrt{5} - 1)/2$ D. 1

151. If $y = - (x^3 + x^6/2 + x^9/3 + ...)$, then

A. $x^3 = 1 - e^y$ B. $x^3 = \log(1 + y)$ C. $x^3 = e^y$ D. $x^3 = 1 + e^y$

152. Vinay, Manish, Rahul, and Sumit have to give speeches in a class. The teacher can arrange the order of their presentation in

A. 12 ways B. 24 ways C. 4 ways D. 256 ways

153. There are n (>2) points in each of two parallel lines. Every point on one line is joined to every point on the other line by a line segment drawn within the lines. The number of points (between the lines) in which these segments intersect is

A. ${}^nC_2 \times {}^nC_2$ B. ${}^{2n}C_2 - 2({}^nC_2)$ C. ${}^{2n}C_2 - 2({}^nC_1) + 2$ D. none of the above

154. The number of ways in which 7 persons can sit around a table so that all shall not have the same neighbours in any two arrangements is

A. 360 B. 720 C. 270 D. 180

155. The length of sub normal to the parabola $y^2 = 4ax$ at any point is equal to

A. $a\sqrt{2}$ B. $2\sqrt{2}a$ C. $a/\sqrt{2}$ D. 2a

156. The expansion of $(8 - 3x)^{3/2}$ in terms of power of x is valid only if

A. $x > 8/3$ B. $| x | < 8/3$ C. $x < 3/8$ D. $x < 8/3$

157. If $y = - (x^3/2 + x^3 - x^4/4 + ...)$, then x is

A. $e^y - 1$ B. log(1 + C. $e^y + 1$ D. e^y

y)

158. If a, b, c are in G.P., then $\log_a m$, $\log_b m$, $\log_c n$ are in

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

159. If A is a matrix of order 3 x 4, then each row of A has

A. 12 elements B. 3 elements C. 7 elements D. 4 elements

160. If A = $\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ **, $n \in N$, then A^{4n} equals**

A. $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$

161. If α , β , γ are the roots of the equation $x^2 + px + q = 0$, then the value of the determinant

$\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$ **is**

A. q B. 0 C. p D. $p^2 - 2q$

162. If A, B, C are any three matrices, then A' + B' + C' is equal to

A. A + B + C B. (A + B + C)' C. - (A + B + C) D. a null matrix

163. If A is any matrix, then the product A.A, i.e., A^2 is defined only when A is a matrix of order

A. m > n B. m = n C. m < n D. m ≥ n

164. The area of the parallelogram of which $\vec{i}$ and $\vec{i} + \vec{j}$ are adjacent is

A. √2 B. 1/2 C. 2 D. 1

165. If the direction cosines of line are (1/c, 1/c, 1/c), then

A. 0 < c < 1 B. c > 2 C. c > 0 D. ± √ 3

166. The sine of the angle between the straight line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ and the plane 2x - 2y + z = 5 is

A. 10/(6√5) B. 4/(5√2) C. √ 2/10 D. (2√ 3)/5

167. Constant term in the expansion of $(x - 1/x)^{10}$ is

A. 152 B. - 152 C. - 252 D. 252

168. The latus rectum of the ellipse $5x^2 + 9y^2 = 45$ is

A. 5/3 B. 10/3 C. (2√5)/3 D. √5/3

169. $i^2 + i^4 + i^6 + ... (2n + 1)$ terms =

A. - 1 B. 1 C. - i D. i

170. If the sum of the series 2, 5, 8, 11, ... is 60100, then n is

A. 100 B. 200 C. 150 D. 250

171. Two of the lines represented by the equation $ay^4 + bxy^3 + cx^2y^2 + dx^3y + ex^4 = 0$ will be perpendicular, then

A. $(b + d)(ad + be) + (e - a)^2(a + c + e) = 0$ B. $(b + d)(ad + be) + (e + a)^2(a + c + e) = 0$

C. $(b - d)(ad - be) + (e - a)^2(a + c + e) = 0$ D. $(b - d)(ad - be) + (e + a)^2(a + c + e) = 0$

172. The probability that an event A happens on trial of an experiment is 0.4. Three independent trials of the experiment are formed. The probability that the event A happens at least once is

A. 0.936 B. 0.784 C. 0.904 D. 0.984

173. The numbers are selected at random from 1, 2, 3, ... 100 and are multiplied, then the

probability correct to two places of decimals that the product thus obtained is divisible by 3, is

A. 0.55 B. 0.44 C. 0.22 D. 0.33

174. If $p^2 + q^2 = 1$ and $m^2 + n^2 = 1$, then

A. $| p_m + q_n | \leq 0$ B. $| p_m + q_n | \leq 1$ C. $| p_q + mn | > 1$ D. $| p_q + mn | < 2$

175. In a football championship, there were played 153 matches. Every two team played one match with each other. The number of teams participating in the championship is

A. 9 B. 11 C. 13 D. 18

176. The solution of $| (x - 1) + 2 | = 1$ is

A. 1 B. 2 C. 5 D. ϕ

177. The equation $\log_e x + \log_e (1 + x) = 0$ can be written as

A. $x^2 + x - e = 0$ B. $x^2 + x - 1 = 0$ C. $x^2 + x + 1= 0$ D. $x^2 + xe - e = 0$

178. Both the roots of the equation $(x - b)(x - c) + (x - a)(x - c) + (x - a)(x - b) = 0$ are always

A. positive B. negative C. real D. imaginary

179. The value of tan x/tan 3x whenever defined never lies between

A. 1/3 and 3 B. 1/4 and 4 C. 1/5 and 5 D. 5 and 6

180. Given $(a + d) > (b + c)$ where a, b, c, d are real numbers, then

A. a, b, c, d are in A.P.

B. 1/a, 1/b, 1/c, 1/d are in A.P.

C. (a + b), (b + c), (c + d), (a + d) are in A.P.

D. 1/(a + b), 1/(b + c), 1/(c + d), 1/(a + d) are in A.P.