PHYSICS

1. Given that the displacement of an oscillating particle is given by y=A sin (Bx + Ct + D). The dimensional formula for (ABCD) is
(a) $[M^0L^{-1}T^0]$ (b) $[M^0L^0T^{-1}]$
(c) $[M^0L^{-1}T^{-1}]$ (d) $[M^0L^0T^0]$

2. In the relation y=a cos (ωt - K*x*), the dimensional formula of k is
(a) $[M^0L^{-1}T^1]$ (b) $[M^0LT^{-1}]$
(c) $[M^0L^{-1}T^0]$ (d) $[M^0LT]$

3. A capillary tube is attached horizontally to a constant heat arrangement. If the radius of the capillary tube is increased by 10 %, then the rate of flow of liquid will change the nearly by
(a) +10% (b) +46%
(c) -10% (d) -40%

4. A man of mass 60 kg is the riding in a lift. The weight of the man, when the lift is accelerating upwards and downwards at 2 ms^{-2}, are respectively
(Taking g=10 ms^{-2})
(a) 720 N sand 480 N
(b)480 N and 720 N
(c)600 N and 600 N
(d)None of the above

5. A man of the mass 60 kg is standing on a spring balance inside a lift. If the lift falls freely downwards, then the reading of the spring balance will be
(a)zero (b)60 kgf
(c)<60 kgf (d)>60 kgf

6. if two forces each of 2 N are inclined at 60°, then resultant force is
(a)2 N (b)2 √ 3 N
(c)3 √ 2 N (d)4 √ 2 N

7. A person of mass 60 kg is inside a lift of mass 940 kg and presses the button on control panel. The lift start moving upwards with an acceleration 1.0 ms^{-2}. If g=10 ms^{-2}, the tension on the supporting cable is
(a) 9680 N (b) 11000 N
(c)1200 N (d)8600 N

8. A mass of 0.5 kg moving with a speed of 0.5 ms-1 on a horizontal smooth surface, collides with a nearly weightless spring of force constant k = 50 Nm^{-1}. The maximum compression of the spring would be
(a) 0.15 m (b) 0.12 m
(c)1.5 m (d) 0.5 m

9. A body is thrown vertically up with certain initial velocity. The potential and kinetic energies of the body are equal at a point P in its path. If the same body is thrown with double the velocity upwards, the ratio of the potential and kinetic energies of the body when its crosses the same point, is
(a)1:1 (b)1:4
(c)1:7 (d)1:8

10 For a system to follow the law of conservation of linear momentum during a collision, the condition is
(a) total external force acting on the system is zero
(b) total external force acting on the system is finite and time of collision is negligible.
(c) total internal force acting on the system is zero.
(d) None of these

SPACE FOR ROUGH WORK

11. Radius of gyration of disk of mass 50 kg and radius .5 cm about an axis passing through its centre of gravity and perpendicular to the plane is
(a) 6.54 cm (b) 3.64 cm
(c) 1.77 cm (d) 0.88cm

12. At any instant, a rolling body may be considered to be in pure rotation about an axis through the point of contact. This axis is translating forward with speed
(a) equal to centre of mass
(b) zero
(c) twice of centre of mass
(d) no sufficient data

13. Which of the following statement is/are trueϙ
(a) A clock when taken on a mountain can be made to give correct time if we change the length of pendulum suitably
(b) An increase in value of g makes a clock go slow
(c) If the length of a pendulum is increased, the clock becomes fast
(d) A clock when taken to a deep mine or carried to the top a mountain becomes slow

14. The density of nearly discovered planet is twice that of earth. The acceleration due to gravity at the surface of the planet is equal to that the surface of the earth. If the radius of the earth is R, the radius of the plane will be
(a) 2R (b)4R
(c) ¼ R (d) ½ R

15. The mass of the earth is 6.00×10^{24} kg and that of the moon is 7.40×10^{22} kg. the constant of gravitation G=6.67×10^{-11} N-m^2kg^2. The potential energy of the system is -7.79×10^{28} J. The mean distance between the earth and moon is
(a) 3.80×10^8 m (b) 3.37×10^6 m
(c) 7.60×10^2 m (d) 1.90×10^2 m

16. At what temperature, hydrogen molecules will escape from the earth's surfaceϙ (take mass of hydrogen molecules = 0.34×10^{-26} kg, Boltzmann constant = 1.38×10^{-23} JK^{-1}, Radius of earth = 6.4×10^6 m and acceleration due to gravity =9.8 ms^{-2})
(a)10 K (b)10^2 K
(c)10^3 K (d)10_4K

17. Wires A and B are made from the same material. A has twice the diameter and the three times of length of B. If the elastic limits are not reached, when each is stretched by the same tension, the ratio of energy stored in A to that in B is
(a) 2:3 (b) 3:4
(c) 3:2 (d) 6:1

18. A stress of 3.18×10^8 Nm^{-2} is applied to a steel rod of length 1m along its length its Young's modulus is 2×10^{11} Nm^{-2}. Then the elongation produced in the rod (in mm) is
(a) 3.18 (b) 6.36
(c) 5.18 (d) 1.59

19. Two rigid boxes containing different ideal gases are placed on table. Box A contains one moles of nitrogen at temperature T_0, while box B contains one mole of helium at temperature (7/3) T_0. The boxes are then put into thermal contact with each other, and heat flows between them until the gases reach a common final temperature (ignore the heat capacity boxes). Then, the final temperature if the gases, T_f, in terms of T_0 is
(a) $T_f = \frac{3}{7}T_0$ (b) $T_f = \frac{3}{7}T_0$
(c) $T_f = \frac{3}{2}T_0$ (d) $T_f = \frac{5}{2}T_0$

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20. Consider the following two statements and choose the correct answer.
(A) If heat is added to a system its temperature must always increase.
(B) If positive work is done by a system in thermodynamic process, its volume must increase.
(a) Both (A) and (B) are correct
(b)(A) is correct, but (B) is wrong
(c) (B) is correct, but (A) is wrong
(d) Both (A) and (B) are wrong

21. **Assertion** Thermodynamic process in nature are irreversible
Reason Dissipative effects cannot be eliminated.
(a) Both assertion and reason are true and reason is the correct explanation of assertion
(b) Both assertion and reason are true but reason is not the correct expansion of assertion
(c) Assertion is true but reason is false
(d) Both assertion and reason are false

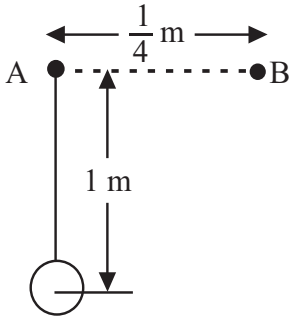
22. Three samples of the same gas, X, Y and Z, for which the ratio of specific heat $\gamma = \frac{3}{2}$ have initially the same volume. The volumes of each sample is doubled, by adiabatic process in the case of X, by isobaric process in the case of Y and by isothermal process in the case of Z. If the initial pressures of the samples X, Y and Z are in the ratio $2\sqrt{2}$:1 : 2 then the ration of their final pressures is
(a) 2 : 1 : 1 (b) 1 : 1 : 1
(c) 1 : 2 : 1 (d) 1 : 1 : 2

23. How much heat energy in joules must be supplied to 14 g nitrogen at room temperature to raise its temperature by 40°C at constant pressure? (Mol. wt. of N_2=28g, R = constant)
(a) 50 R (b) 60 R
(c) 70 R (d) 80 R

24. A given mass of a gas is compressed isothermally until its pressure is doubled, It is then allowed to expand adiabatically until its original volume is restored and its pressure is then found to be 0.75 of its initial pressure. The ratio of the specific heat of the gas is approximately
(a) 1.20 (b) 1.41
(c) 1.67 (d) 1.83

25. Two vessels A and B having equal volume contain equal masses of hydrogen in A and helium in B at 300 k. then, mark the correct statement.
(a)The pressure exerted by hydrogen is half the exerted by helium.
(b) The pressure exerted by hydrogen is equal to that exerted by helium.
(c) Average KE of the molecules of hydrogen is half the average KE of the molecules of helium.
(d) The pressure exerted by hydrogen is twice that exerted by helium.

26 A simple pendulum has a bob suspended by an inextensible thread of length I metre from a point A of suspension. At the extreme position of oscillation, the thread is suddenly caught by a peg at a point



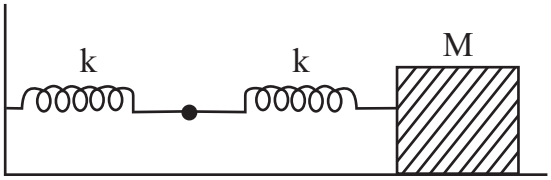
SPACE FOR ROUGH WORK

B distant (1/4) m from A and the bob begins to oscillate in the new condition. Thechange in frequency of oscillation of the pendulum is approximately given by ($g = 10\ m/s^2$)

(a) $\frac{\sqrt{10}}{2}$ hertz (b) $\frac{1}{4\sqrt{10}}$ hertz

(c) $\frac{\sqrt{10}}{3}$ hertz (d) $\frac{1}{\sqrt{10}}$ hertz

27. Two springs are connected to a block of mass M placed on a frictionless surface as shown below. If both the springsd have a spring constant k, the frequency of oscillation of the block is



(a) $\frac{1}{2\pi}\sqrt{\frac{k}{M}}$ (b) $\frac{1.}{2\pi}\sqrt{\frac{k}{2M}}$

(c) $\frac{1}{2\pi}\sqrt{\frac{2k}{M}}$ (d) $\frac{1.}{2\pi}\sqrt{\frac{M}{k}}$

28. An earthquake generates both transverse (S) and longitudinal (P) sound waves in the earth. The speed of S waves is about 8.0 km/s. A seismograph records P and S waves from an earthquake. The first P wave arrives 4.0 min before the first S wave. The epicenter of the earthquake is located at a distance about

(a) 25 km (b) 250 km

(c) 2500 km (d) 5000 km

29. What is your observation when two source are emitting sound with frequency 499 Hz and 501 Hzϙ

(a) Frequency of 500 Hz is heard with change in intensity take place twice.

(b) Frequency of 500 Hz is heard with change in intensity take place once.

(c) Frequency of 2 Hz is heard with change in intensity take place once.

(d) Frequency of 2 Hz is heard with change in intensity take place twice.

30. An electric charge 10^{-3} μC is place at the origin (0, 0) of (x – y) co-ordinate system. Two points A and B are situated at ($\sqrt{2}$, $\sqrt{2}$) and (2, 0) respectively. The potential difference between the point A and B will be

(a) 4.5 volt (b) 9 volt

(c) Zero (d) 2 volt

31. Seven capacitors each of capacitance 2μF are to be connected to obtain a capacitance of $\frac{10}{11}$ μF which of the following combination is possibleϙ

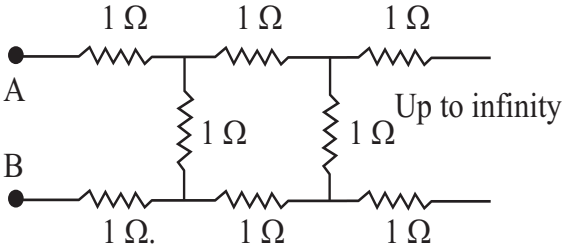
(a) 5 in parallel, 2 in series

(b) 4 in parallel, 3 in series

(c) 3 in parallel, 4 in series

(d) 2 in parallel, 5 in series

32. The resistance between the terminal points A and B of the given infinitely log circuit will be



(a) $\sqrt{3}$-1Ω (b) 1-$\sqrt{3}$ Ω

(c) 1+$\sqrt{3}$ Ω (d) 2+$\sqrt{3}$ Ω.

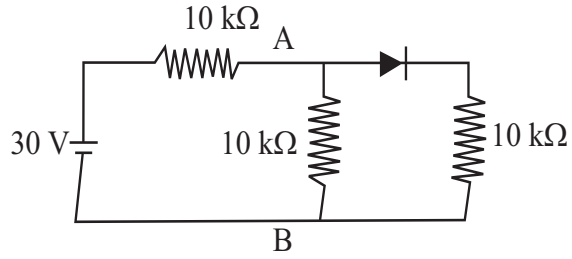
SPACE FOR ROUGH WORK

33. Two heater wires, made of the same material and having the same length and the same radius, are first connected in series and then in parallel to a constant potential difference. If the rate of heat produced in the two cases are H_s and H_p respectively, then H_s / H_p will be

(a) ½ (b)2

(c) ¼ (d) 4

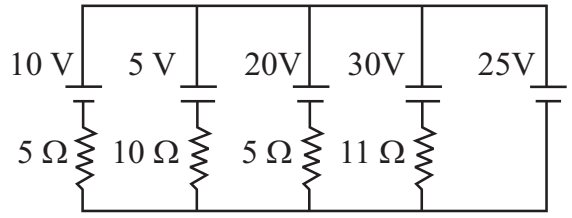
34. In the given circuit, the potential difference between A and B is



(a) 0 (c) 5 volt

(b) 10 volt (d) 15 volt

35. In the circuit shown, current flowing through 25 V cell is



(a) 7.2 A (b) 10 A

(c) 12 A (d) 14.2 A

36. A battery is connected from two points A and B on the circumference of a uniform conducting ring of radius r and resistance R. one of the arcs AB of the ring subtends an angle θ at the centre. The value of the magnetic induction at the centre due to current in the ring is

(a) Proportional to 2 (180° - θ)

(b) Inversely proportional to r

(c) Zero, only if θ=180°

(d) Zero for all values of θ

37. Two particles, each of mass m and charge q, are attached to the two ends of a light rigid rod of length 2R. the rod is rotated at constant angular speed about a perpendicular axis passing through its centre. The ratio of the magnitude of the magnetic moment of the system and its angular momentum about the centre of the radius of the rod is

(a) $\frac{q}{2m}$ (b) $\frac{q}{m}$

(c) $\frac{2q}{m}$ (d) $\frac{q}{\pi m}$

38. Two identical circular loops of metal wire are lying on a table without touching each other. Loop-A carries a current which increase with time. In response the loop-B

(a) remains stationary

(b) is attracted by the loop-A

(c) is repelled by the loop-A

(d) rotates about its CM, with CM fixed

39. A coil of wire having inductance and resistance has a conducting ring placed coaxially within it. The coil is connected to a battery at time t = 0, so that a time –dependent current $I_1(t)$ start following through the coil. If $I_2(t)$ is the current induced in the ring ,and B(t) is the magnetic field at the axis of the coil due to $I_1(t)$, then as a function of time (t > 0), the product $I_2(t)$ B(t)

(a) increase with time

(b) decrease with time

(c) does not vary with time

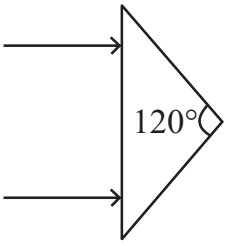
(d) passes through a maximum

SPACE FOR ROUGH WORK

40. A solenoid has inductance of 10 henry and a resistance of 2 ohm. It is connected to a 10 volt battery. How long will it take for the magnetic energy to reach ¼ of its maximum valueϕ

(a) 3.466 sec (b) 3.046 sec
(c) 3.646 sec (d) 3.004 sec

41. An isosceles prism of angle 120° has a refreative index1.44. Two parallel monochromatic rays enter the prism parallel to each other in air as shown. The rays emerge from the opposite faces



(a) are parallel to each other
(b) are diverging
(c) make an angle 2 [$\sin^{-1}$(0.72-30)°] with each other
(d) make angle 2$\sin^{-1}$ (0.72) with each other

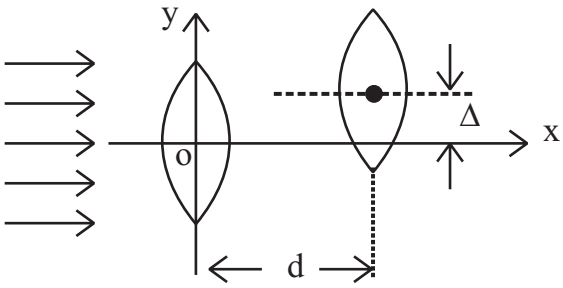
42. In a double slit experiment instead of taking slits of equal widths, one slit is made twice as wide as the other. Then, in the interference pattern

(a) the intensities of both the maxima and the minima increase
(b) the intensity of the maxima increase and the minima has zero intensity
(c) the intensity of the maxima decrease and that of the minima increase
(d) the intensity of the maxima decrease and the minima, a has zero intensity

43. Two beams of light having intensities I and 4I interference to produce a fringe pattern on a screen. The phase difference between the beams is π/ 2 at point A and π at point B. Then the difference between the resultant intensities at A and B is

(a) 2I (b) 4I
(c) 5I (d) 7I

44. Two thin convex lenses of focal lengths f_1 and f_2 are separated by horizontal distance d (where $d < f_1, d < f_2$) and their centres are displaced by a vertical separation Δ as shown in the fig .



(a) $x = \frac{f_1 f_2}{f_1 + f_2}$, $y = \Delta$

(b) $x = \frac{f_1 (f_2 + d)}{f_1 + f_2 - d}$, $y = \frac{\Delta}{f_1 + f_2}$

(c) $x = \frac{f_1 f_2 + d(f_1 - d)}{f_1 + f_2 - d}$, $y = \frac{\Delta(f_1 - d)}{f_1 + f_2 - d}$

(d) $x = \frac{f_1 f_2 + d(f_1 - d)}{f_1 + f_2 - d}$, $y = 0$

45. A concave mirror is placed on a horizontal table, with its axis directed vertically upwards. Let o be the pole of the mirror and C its centre of curvature. A point object is placed at C. It has a real image, also located at C. If the mirror is now filled with water, the image will be.

(a) real, and will remain at C.
(b) real, and located at a point between C and ∞.
(c)virtual, and located at a point between C and O.
(d) real, and located at point between C and O.

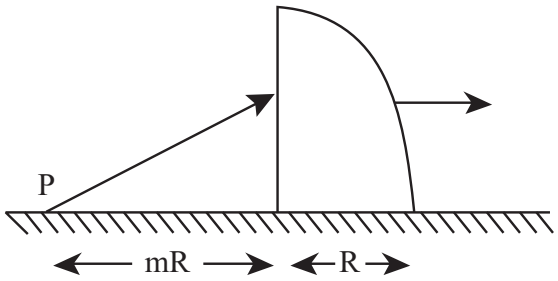
46. In Young's experiment, the upper slits is covered by a thin glass plate of refractive index 1.4 while the lower slit is covered

SPACE FOR ROUGH WORK

by another glass plate, having the same thickness as the first one but having refractive index 1.7. Interference pattern is observed using light of wavelength 5400 Å. It is found that the point P on the screen where the central maximum(n=0) fells before the glass plates were inserted now has ¾ the original intensity. It is further observed that what use to be the fifth maximum earlier, lies below the point P while the six minimum lies above P. Calculate the thickness of the glass of the plate. (Absorption of light by glass plate may be neglected.)

(a) 9.3×10^{-6} (b) 3.9×10^{-8}
(c) 9.3×10^{-16} (d) 3.9×10^{8}

47. A quarter cylinder of radius R and refractive index 1.5 is placed on a table A point object P is kept at a distance of mR from it. Find the value of m for which a ray from P will emerge parallel to the table as shown in Figure.



(a) 3/4 (b) 2/5
(c) 5/2 (d) 4/3

48. Two radioactive materials X_1 and X_2 have decay constants 10λ and respectively. If initially they have the same number of nuclei, then the ratio of the number of nuclei X_1 to that of X_2 will be 1/e after a time.

(a) $\frac{1}{10\lambda}$ (b) $\frac{1}{11\lambda}$
(c) $\frac{11}{10\lambda}$ (d) $\frac{1}{9\lambda}$

49. The half-life period of a radioactive element X is same as the mean-life time of another radioactive element Y. Initially both of them have has the same numbers of atoms. Then
(a) X and Y have the same decay rate initially
(b) X and Y have the same decay rate always
(c) Y will decay at a faster rate than X
(d) X will decay at a faster rate than Y

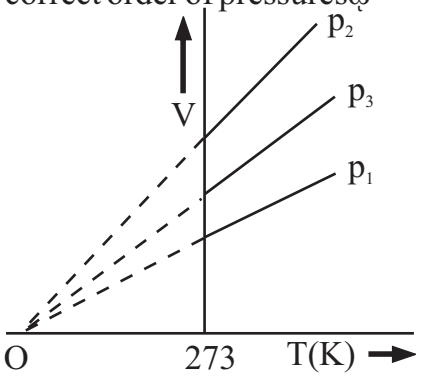
50. Electrons with energy 80 keV are incident of the tungsten target of an X-ray tube. K-shell electrons of tungsten have 72.5 ke V energy. X-rays emitted by the tube contain only
(a) a continuous X-ray spectrum (Bremsstrahlung) with a minimum wavelength of 0.155Å
(b) a continuous X-ray spectrum (Bremsstrahlung) with a minimum wavelength of all wavelengths
(c) the characteristic X-ray spectrum of tungsten.
(d) a continuous X-ray spectrum (Bremsstrahlung) with a minimum wavelength of 0.155Å and the characteristic X-ray spectrum of tungsten.

SPACE FOR ROUGH WORK

CHEMISTRY

51. Number of atoms in 560 g of Fe (atomic mass 56 g mol^{-1}) is
(a) twice that of 70 g N
(b) half that of 20 g H
(c) both are correct
(d) none of these

52. The volume - temperature graphs of a given mass of an ideal gas at constant pressures are shown below. What is the correct order of pressures?



(a) $p_1 > p_3 > p_2$ (b) $p_1 > p_2 > p_3$
(c) $p_2 > p_3 > p_1$ (d) $p_2 > p_1 > p_3$

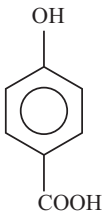
53. The rms speed of hydrogen is $\sqrt{7}$ times the rms speed of nitrogen. If T is the temperature of the gas. then
(a) $T_{H_2} = T_{N_2}$ (b) $T_{H_2} > T_{N_2}$
(c) $T_{H_2} < T_{N_2}$ (d) $T_{H_2} = \sqrt{7}T_{N_2}$

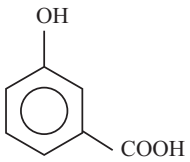
54. The energies, E_1 and E_2 of two radiation are 25 eV and respectively. The relation between their wavelengths i.e., λ_1 and λ_2 will be
(a) $\lambda_1 = 1/2\ \lambda_2$ (b) $\lambda_1 = \lambda_2$
(c) $\lambda_1 = 2\ \lambda_2$ (d) $\lambda_1 = 4\lambda_2$

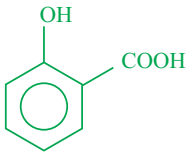
55. Which of the following is not possible for 4p or 3d electrons?
(a) n= 3, l=2, m= +1, s= +1/2
(b) n= 4, l=1, m= 0, s= +1/2
(c) n= 3, l=3, m= +3, s= +1/2
(d) n= 4, l=1, m= -1, s= +1/2

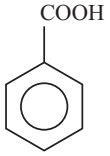
56. Among of the following the pair in which the two species are not isostructural is
(a) IO_3^- and XeO_3
(b) PF_6^- and SF_6
(c) BH_4^- and NH_4^+
(d) CO_3^{2-} and NO_3^-

57. Which of the following compound has maximum volatility?

(a) 

(b) 

(c) 

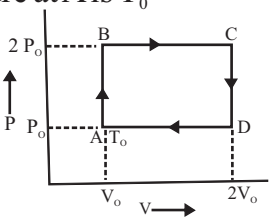
(d) 

58. N_2 and O_2 are converted into N_2^+ and O_2^+ respectively. which of the following is not correct?
(a) In N_2^+, the N—N bond weakens
(b) In O_2^+, the O—O bond order increases
(c) In O_2^+, paramagnetism decreases
(d) N_2^+, becomes diamagentic

59. If C_p and C_v are the specific heat for a gas at constant pressure and at constant volume respectively, then the relation $C_p - C_v = R$ is exact for
(a) Ideal gas and the nearly true for real gases at high pressure
(b) Ideal and real gases at all pressures
(c) Ideal gas and the nearly true for real gases at moderate pressure
(d) Ideal gas at all pressure and real gas at moderate pressure.

SPACE FOR ROUGH WORK

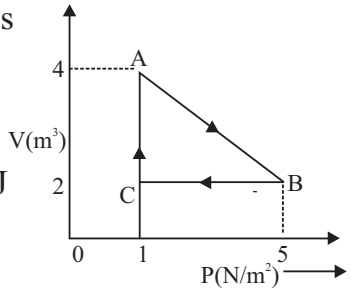
60. *n* moles of a monoatomic gas is carried round the reversible rectangular cycle ABCDA as shown in the diagram. The temperature at A is T_0



The thermodynamic efficiency of the cycle is

(a) 15 % (b) 50 %
(c) 20 % (d) 25 %

61. An ideal gas is taken through the cycle A→B→C→A, as shown in figure. If the net heat supplied to the gas in the cycle is 5 J the work done by the gas in the process A→ B is



(a) 2J (b) 3J
(c) 4J (d) 5J

62. Which of the following azeotropic solutions has the boiling point less than boiling point of the constituents A and Bϙ

(a) $CHCl_3$ and CH_3COCH_3
(b) CS_2 and CH_3COCH_3
(c) CH_3CH_2OH and CH_3COCH_3
(d) CH_3CHO and CS_2

63. 0.01 M solution of KCl and $BaCl_2$ are prepared in water. The freezing point of KCl is found to be -2°C. What is the freezing point of $BaCl_2$ to be completely ionizedϙ

(a) -3°C (b) +3°C
(c) -2°C (d) -4°C

64. In chemical equilibrium, the value of Δn is negative, then the relationship between K_p and K_c will be

(a) Kp = Kc (b) Kp< Kc
(c) Kp> Kc (d) None of these

65. The solubility of CuBr is 2 x 10^{-4} mol/L at 25°C. The K_{sp} value of CuBr is

(a) 4 x 10^{-8} mol^2 L^{-2}
(b) 4 x 10^{-4} mol^2 L^{-2}
(c) 4 x 10^{-11} mol^2 L^{-2}
(d) 4 x 10^{-15} mol^2 L^{-2}

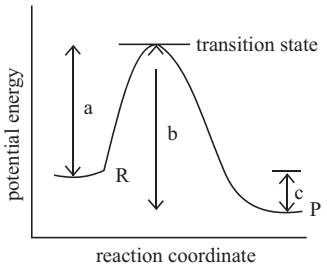
66. For the redox reaction,
$MnO^-_4 + C_2O^{2-}_4 + H^+ \rightarrow Mn^2 + CO_2 + H_2O$
The correct stoichiometric cofficients of MnO_4^-, $C_2O_4^{2-}$ and H^+ are

(a) 2, 5, 16 (b) 16, 5, 2
(c) 5, 16, 2 (d) 2, 16, 5

67. A first order reaction, which is 30 % complete in 30 minutes has a half life period of

(a) 102.2 min (b) 58.2 min
(c) 24.2 min (d) 120.2 min

68. The potential energy diagram for a reaction R→P is given in the figure.ΔH° of the reaction corresponds to the energy



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

69. The first order reaction is carried out starting with 10 mol L^{-1} of the reactant. It is 40 % complete in one hour. If the same reaction is carried out with an initial

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concentration of 5 mol L^{-1}, the percentage of the reaction that is completed in one hour will be
(a) 40 % (b) 80 %
(c) 20 % (d) 60 %

70. Among the follwing the surfactant that will form micelles in aqueous solution at the lowest molar concentration at ambient conditions is
(a) $CH_3(CH_2)_{15}N^+(CH_3)_3Br^-$
(b) $CH_3(CH_2)_{11}OSO_3^-Na^+$
(c) $CH_3(CH_2)_6COO^-Na^+$
(d) $CH_3(CH_2)_{11}N^+(CH_3)_3Br^-$

71. Among the electrolytes Na_2SO_4, $CaCl_2$, $Al_2(SO_4)_3$ and NH_4Cl, the most effective coagulating agent for Sb_2S_3
(a) Na_2SO_4 (b) $CaCL_2$
(c) $Al_2(SO_4)_3$ (d) NH_4Cl

72. Na_2O, MgO,Al_2O_3 and SiO_2 have heat of formation equal to -416, -602, -1676, and -911 kJ mol^{-1} respectively. The most stable oxide is
(a) Na_2O (b) MgO
(c) Al_2O_3 (d) SiO_2

73. One mole of the magnesium in the vapour state absorbed 1200 kJ mol^{-1} of energy. If the first and second ionization energies of Mg are 750 and 1450 kJ mol^{-1} respectively, the final composition of the mixture is
(a) 31 % Mg^+ + 69 % Mg^{2+}
(b) 69 % Mg^+ + 31 % Mg^{2+}
(c) 86 % Mg^+ + 14 % Mg^{2+}
(d) 14 % Mg^+ + 86 % Mg^{2+}

74. Which one of the following reactions represents the oxidising property of H_2O_2?
(a) $2KMnO_4 + 3H_2SO_4 + 5H_2O_2 \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 5O_2$
(b) $2K_3[Fe(CN)_6] + 2KOH + H_2O_2 \rightarrow 2K_4[Fe(CN)_6] + 2H_2O + O_2$
(c) $Pb_2 + H_2O_2 \rightarrow PbO + H_2O + O_2$
(d) $2KI + H_2SO_4 + H_2O_2 \rightarrow K_2SO_4 + I_2 2H_2O$

75. Which sequence of reactions shwos correct chemical relation between sodium and its compounds?
(a) $Na\ O_2 \rightarrow Na_2O \xrightarrow{HCl\ (aq)} NaCl \xrightarrow{CO_2} Na_2CO_3 \xrightarrow{\Delta} Na$
(b) $Na + \xrightarrow{O_2} Na_2O \xrightarrow{H_2O} NaOH \xrightarrow{CO_2} Na_2CO_3 \xrightarrow{\Delta} Na$
(c) $Na + H_2O \rightarrow NaOH \xrightarrow{HCl} NaCl \xrightarrow{CO_2} Na_2CO_3 \xrightarrow{\Delta} Na$
(d) $Na + H_2O \rightarrow NaOH \xrightarrow{CO_2} Na_2CO_3 \xrightarrow{HCl} NaCl_{(molten)} \xrightarrow{Electrolysis} Na + Cl$

76. Aqueous solution of $Na_2S_2O_3$ on reaction with Cl_2 gives
(a) $Na_2S_4O_6$ (b) $NaHSO_4$
(c)NaCl (d) NaOH

77 Assertion Barium is not required for normal biological function in human.
Reason Barium does not show variable oxidation state.
(a) Both Assertion and reason are true and reason is the correct explanation Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

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78. **Assertion** Silica is soluble in HF.
Reason $SiO_2 + 4HF \rightarrow SiF_4 + 2H_2O$
$SiF_4 + 2HF \rightarrow H_2SiF_6$
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertionand Reason are false.

79. Assertion Silicones are hydrophobic in nature. Reason Si— O—Si linkages are moisture sensitive.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true and Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is true is false.
(d) Both Assertion and Reason are false.

80. A transition metal ' A ' has 'spin-only' magnetic moment value of 1.8 BM. When it is reacted with dilute sulphuric acid in the presence of air, a compound ' B ' is formed. ' B ' reacts with compound 'C' to give compound ' D 'with liberation of iodine. Then the metal A and compounds B, C and D are respectively

(a) Ti, $TiSO_4$, KI and TiI_2
(b) Zn, $ZnSO_4$, KI and Zn_2I_2
(c) Cu, $CuSO_4$,KI and Cu_2I_2
(d) Cu, $CuSO_4$, Cu_2I_2 and CuI_2

81. The actinoids exhibit more number of oxidation state in general then the lanthanoids. This is because
(a) The 5*f*- orbitals are more buried than the 4*f*-orbiitals.
(b) There is similar between 4*f* and 5*f*-orbitals in their angular part of the wave function.
(c) The actinoids are more reactive than the lanthanoids.
(d) The 5*f*-orbitals extend further from the nucleus than the 4*f*-orbitals.

82. **Assertion** If β_4 for $[Cu(NH_3)_4]^{2+}$ is 2.1×10^{13}, its instability constant is 4.76×10^{-14}
Reason overall dissociation equilibrium constant varies inversely with formation constant.
(a) Both assertion and reason are true and the reason is the correct explanation of Assertion.
(b) Both assertion and reason are true and the reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is true is false.
(d) Both Assertion and Reason are false.

83. Aluminium reacts with NaOH and forms compound ' X '. if the coordination number of aluminium in ' X ' is 6, the correct formula of X is

(a) $[Al(H_2O)_4(OH)_2]^+$
(b) $[Al(H_2O)_3(OH)_3]$
(c) $[Al(H_2O)_2(OH)_4]^-$
(d) $[Al(H_2O)_6](OH)_3$

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84. Two isomers X and Y with the formula $Cr(H_2O)_5 ClBr_2$ were taken for the experiment on depression on freezing point. It was found that one mole of X gave depression corresponding to 2 moles of particles and one mole of Y gave depression due to 3 moles of particles. The structural formula of X and Y respectively, are
(a) $[Cr(H_2O)_5Cl]Br_2$; $[Cr(H_2O)_4Br_2]Cl.H_2O$
(b) $[Cr(H_2O)_5Cl]Br_2$; $[Cr(H_2O)_3ClBr_2.2H_2O]$
(c) $[Cr(H_2O)_5 Br]BrCl$;$[Cr(H_2O)_4 ClBr]Br.H_2O$
(d) $[Cr(H_2O)_4Br_2]ClH_2O$;$[Cr(H_2O)_5 Cl]Br_2$

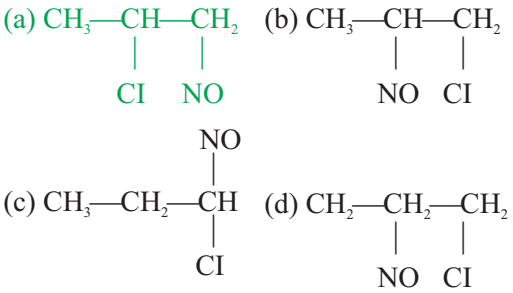
85. Among the following complexes (K-P), $K_3[Fe(CN)_6]$ (K), $[Co(NH_3)_6]CI_3$ (L), $Na_3[Co(ox)_3]$(M)
$[Ni(H_2O)_6] Cl_2$(N), $K_2[Pt(CN)_4]$ (O) and $[Zn(H_2O)_6] (No_3)_2$ (P)the diamagnetic complexes are
(a) K, L, M, N (b) K, M, O, P
(c) L, M, O, P (d) L, M, N, O

86 Both$Co^{+3}$and Pt^{4+}have a coordination number of six. Which of the following pairs of complexes will show approximately the same electrical conductance for their 0.001 M aqueous solutionsϙ
(b) $CoCl_3 . 4NH_3$ and $PtCl_4 . 4NH_3$
(b) $CoCl_3 . 3NH_3$ and $PtCl_4 . 5NH_3$
(c) $CoCl_3 . 6NH_3$ and $PtCl_4 . 5NH_3$
(d) $CoCl_3 . 6NH_3$ and $PtCl_4 . 3NH_3$

87. What are X and Y respectively in the following reactionϙ
Z-product $\xleftarrow{y}$ 2-butyne $\xrightarrow{x}$ E-product
(a) Na/NH_3(liq.)and $Pd/BaSO_4 + H_2$
(b) Ni/140°C and $Pd/BaSO_4 + H_2$
(c) Ni/140°C and Na/NH_3(liq.)
(d) $Pd/BaSO_4 + H_2$ and Na/NH_3(liq.)

88. The dihalogen derivative 'X' of a hydrocarbon with three carbon atoms reacts with alcoholic KOH and produces another hydrocarbon which forms as red precipitate with ammoniacal Cu_2Cl_2. 'X' gives an aldehydes on reaction with aqueous KOH. The compound 'X' is
(a) 1, 3-dichloropropane
(b) 1, 2-dichloropropane
(c) 2, 2-dichloropropane
(d) 1, 1-dichloropropane

89. $CH3—CH = CH_2 + NOCl \rightarrow P$
Identify the adduct



90. Gasoline with an octane number of 80 is equivalent in knocking characteristics to a mixture of heptane and iso-octane of the following composition
(a) 20 % heptane + 80 % iso-octane
(a) 90 % heptane + 10 % iso-octane
(c) 80 % heptane + 20 % iso-octane
(d) 10 % heptane + 90 % iso-octane

91. The structure of the compound formed, when nitrobenzene is reduced by lithium aluminium hydride ($LiAlH_4$) is

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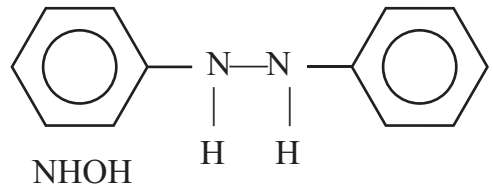
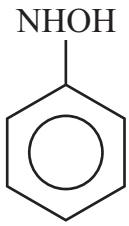
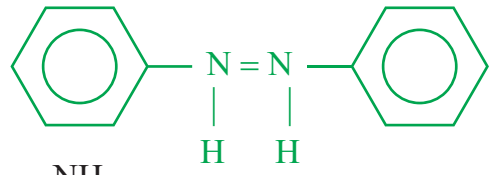
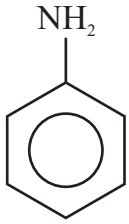
(a) 

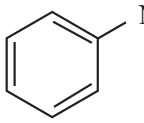
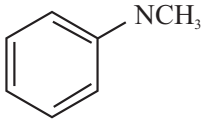
(b) 

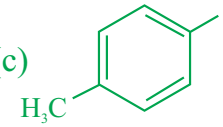
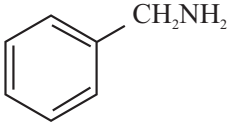
(c) 

(d) 

92. Which of the following reaction can produce aniline as main productφ
(a) $C_6H_5NO_2$ + Zn / KOH
(b) $C_6H_5NO_2$ + Zn / NH_4Cl
(c) $C_6H_5NO_2$ + $LiAlH_4$
(d) $C_6H_5NO_2$ + Zn / HCl.

93. Amongst the compounds given the one that would from a brilliant coloured dye on treatment with $NaNO_2$ in dil. HCI followed by addition to an alkaline solution of β-naphthol is

(a)  (b) 

(c)  (d) 

94. Aniline is not the major product in one of the following reactions. Identify that reaction.

(a) $C_6H_5OH + NH_3 \xrightarrow[300°C]{Zncl_2}$

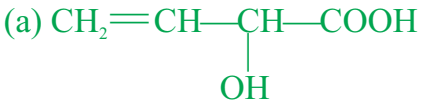
(b) $C_6H_5NO_2$ + ZN powder $\xrightarrow{\text{Alcoholic KOH}}$

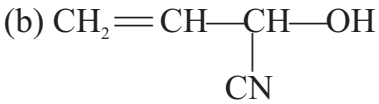
(c) $C_6H_5CI + NH_3 \xrightarrow[Cu_2O]{200°C}$ high pressure

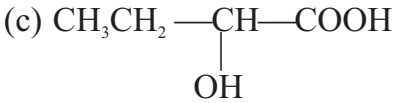
(d) $C_6H_5NO_2 + 6\,(H) \xrightarrow[HCI]{Fe+H_2O}$

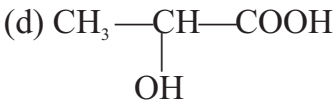
95. Arrange the following compounds in decreasing order of their boiling points.
CH_3CHO, CH_3CH_2OH, CH_3OCH_3, $CH_3CH_2CH_3$
(a) $CH_3CH_2CH_3 < CH_3OCH_3 < CH_3CHO < CH_3CH_2OH$
(b) $CH_3CH_2CH_3 < CH_3CHO < CH_3OCH_3 < CH_3CH_2OH$
(c) $CH_3CH_2CH_3 > CH_3CHO > CH_3OCH_3 > CH_3CH_2OH$
(d) $CH_3CH_2OH > CH_3CHO > CH_3OCH_3 > CH_3CH_2CH_3$

96. $CH_3CHO + HCHO \xrightarrow[heat]{\text{Dil. NaOH}} A \xrightarrow[H_3O]{HCN} B$,
The structure of Compound B is

(a) 

(b) 

(c) 

(d) 

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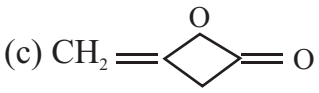
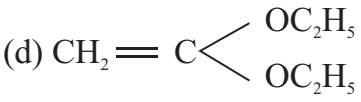
97. $CH_3CO_2C_2H_5$ on reaction with sodium ethoxide in ethanol gives A, which on heating in the presenceof acid gives B. Compound B is

(a) CH_3COCH_2COOH

(c) 

(b) CH_3COCH_3

(d) 

98. An organic compound 'X' with molecular formula, C_7H_8O is insoluble in aqueous $NaHCO_3$ but dissolves in NaOH. When treated with bromine water 'X' rapidly gives 'Y' $C_7H_5OBr_3$.
The compounds 'X' and 'Y' respectively, are
(a) benzyl alcohol and 2, 4, 6-tribromo-3-methoxy phenol benzene
(b) benzyl alcohol and 2, 4, 6-tribromo-3-methyl phenol.
(c) o-cresol and 3, 4, 5-tribromo-2-methyl phenol
(d) methoxybenzen and 2, 4, 6-3methoxy benzene.

99. At pH = 4, glycine exists as
(a) $H_3N—CH_2—COO^-$
(b) $H_3N—CH_2—COOH$
(c) $H_2N—CH_2—COOH$
(d) $H_2N—CH_2—COO^-$

100. Among cellulose poly (vinyl chloride), nylon and natural rubber, the polymer in which the intermolecular force of attraction is weakest in
(a) nylon
(b) poly (vinyl chloride)
(c) cellulose
(d) natural rubber .

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MATHEMATICS

101. If x satisfies $|x-1|+|x-2|+x-3| \geq 6$, then

(a) $0 \leq x \leq 4$ (b) $x \leq -2$ or $x \geq 4$
(c) $x \leq 0$ or $x \geq 4$ (d) None of these

102. Suppose $f(x) = (x+1)^2$ for $x \geq -1$. If $g(x)$ is the function whose graph is the reflection of the graph of $f(x)$ with respect to the line $y = x$, then $g(x)$ equals

(a) $-\sqrt{x-1}$, $x \geq 0$ (b) $\frac{1}{(x+1)^2}$, $x > -1$

(c) $-\sqrt{x+1}$, $x \geq -1$ (d) $\sqrt{x}-1$, $x \geq 0$

103. If functions $f(x)$ and $g(x)$ are defined on $R \to R$ such that

$$f(x) = \begin{cases} 0, & x \in \text{rational} \\ x, & x \in \text{irrational} \end{cases}$$

$$g(x) = \begin{cases} 0, & x \in \text{rational} \\ x, & x \in \text{irrational} \end{cases}$$ then

$(f-g)(x)$ is
(a) one-one & onto
(b) neither one-one nor onto
(c) one-one but not onto
(d) onto but not one-one

104. The maximum distance from the origin of co-ordinates to the point z satisfying the equation $\left|z + \frac{1}{z}\right| = a$ is :

(a) $\frac{1}{2}(\sqrt{a^2+1} + a)$ (b) $\frac{1}{2}(\sqrt{a^2+2} + a)$

(c) $\frac{1}{2}(\sqrt{a^2+4} + a)$ (b) none of these

105. If z_1, z_2 and z_3 are three complex numbers such that $|z1| = |z_2| = |z_3| = \left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3}\right| = 1$, then $|z_1| = |z_2| = |z_3|$ is :

(a) equal to 1 (b) less than 1
(c) greater than 3 (d) equal to 3

106. Let p and q be real numbers such that $p \neq 0$, $p^3 \neq q$ and $p^3 \neq -q$, If α and β are nonzero complex numbers satisfying $\alpha + \beta = -p$ and $\alpha^3 + \beta^3 = q$, then quadratic equation having $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ as its roots is

(a) $(p^3 + q)x^2 - (p^3 + 2q)x + (p^3+q) = 0$
(b) $(p^3 + q)x^2 - (p^3 - 2q)x + (p^3+q) = 0$
(c) $(p^3 - q)x^2 - (5p^3 - 2q)x + (p^3-q) = 0$
(d) $(p^3 - q)x^2 - (5p^3 + 2q)x + (p^3-q) = 0$

107. If a, b, c, d are positive real number such that $a + b + c + d = 2$, then $M = (a + b)(c + d)$ satisfies the relation

(a) $0 \leq M \leq 1$ (b) $0 \leq M \leq 2$
(c) $2 \leq M \leq 3$ (d) $3 \leq M \leq 4$

108. Let a, b, c, be the real numbers. Then following system of equations in x, y and z

$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$, $\frac{x^2}{a^2} - \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$,

$-\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$ has

(a) no solution
(b) unique solution
(c) infinitely many solution
(d) finitely many solution

109. If $P = \begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}$ and $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$

and $Q = PAP^T$ and $x = P^T Q^{2005} P$ then x is equal to

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(a) $\begin{bmatrix} 1 & 2000 \\ 0 & 1 \end{bmatrix}$

(b) $\begin{bmatrix} 4 + 2005\sqrt{3} & 6015 \\ 2005 & 4 - 2005\sqrt{3} \end{bmatrix}$

(c) $\frac{1}{4}\begin{bmatrix} 2+\sqrt{3} & 1 \\ -1 & 2-\sqrt{3} \end{bmatrix}$

(d) $\frac{1}{4}\begin{bmatrix} 2005 & 2-\sqrt{3} \\ 2+\sqrt{3} & 2005 \end{bmatrix}$

110. Then sum of the rational terms in the expansion of $(\sqrt{2} + 3^{1/5})^{10}$ is .....
(a) 40 (b) 41
(c) 43 (d) 47

111. If ${}^{n-1}C_r = (k^2 - 3)\,{}^{n}C_{r+1}$, then $k \in$
(a) $(-\infty, -2]$ (b) $[2, \infty)$
(c) $[-\sqrt{3}, \sqrt{3}]$ (d) $(\sqrt{3}, 2]$

112. For r = 0, 1..., 10, let A_r B_r and C_r denote, respectively, the coefficient of x^r in the expansions of $(1 + x)^{10}$, $(1 + x)^{20}$ and $(1 + x)^{30}$. Then $\sum_{r=1}^{10} A_r (B_{10}B_r - C_{10} A_r)$ is equal to
(a) $B_{10} - C_{10}$ (b) $A_{10}(B^2_{10}C_{10}A_{10})$
(c) 0 (d) $C_{10} - B_{10}$

113. If the coefficient of x^7 in $\left[ax^2 + \left(\frac{1}{bx}\right)\right]^{11}$ equals the cofficient of x^{-7} in $\left[ax - \left(\frac{1}{bx^2}\right)\right]^{11}$, then a and b satisfy the relation
(a) a - b = 1 (b) a + b = 1
(a) $\frac{a}{b} = 1$ (d) ab = 1

114. If the expansion in powers of x of the function $\frac{1}{(1-ax)(1-bx)}$ is $a_0 + a_1x + a_2x^2 + a_3x^3$ ..... then a_n is
(a) $\frac{b^n - a^n}{b - a}$ (b) $\frac{a^n - b^n}{b - a}$
(c) $\frac{a^{n+1} - b^{n+1}}{b - a}$ (b) $\frac{b^{n+1} - a^{n+1}}{b - a}$

115. Let p and q be roots of the equation $x^2 - 2x + A = 0$ and let r and s be the roots of the equation $x^2 - 18x + B = 0$. If $p < q < r < s$ are in arithmetic progression, then A = ... and B = ...
(a) -3,77 (b) 3,77
(c) -3,-77 (d) 3,-77

116. Consider an infinite geometric series with first term a and common ratio r. If its sum is 4 and the second term is 3/4, then
(a) $a = \frac{4}{7}, r = \frac{3}{7}$ (b) $a = 2, r = \frac{3}{8}$
(c) $a = \frac{3}{2}, r = \frac{1}{2}$ (d) $a = 3, r = \frac{1}{4}$

117. If $\log_3 2$, $\log_3 (2^x - 5)$, and $\log_3 \left(2^x - \frac{7}{2}\right)$ are in arithmetic progression, determine the value of x.
(a) -5 (b) 5
(c) 7 (d) 3

118. It is given that $f'(a)$ exists, then $\lim_{x \to a} \frac{x\,f(a) - a\,f(x)}{x - a}$ is equal to
(a) f(a) -a f'(a) (b) f'(a)
(c) f(a) -f'(a) (d) f(a) + f'(d)

119. in order that the function $f(x) = (x + 1)^{\cot x}$ is continuous at x = 0, f(0)must be defined as
(a) $f(0) = \frac{1}{e}$ (b) f(0) = 0
(c) f(0) = e (b) None of these

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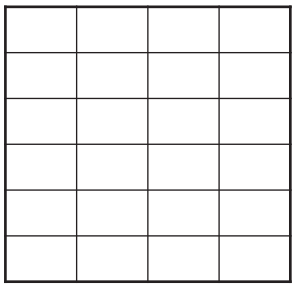
120. If $f: R \to R$ is defined by $f(x) = [x - 3] + |x - 4|$ for $x \in R$, then $\lim_{x \to 3} f(x)$ is equal to
(a) -2 (b) -1
(c) 0 (d) 1

121. Let $f(x) = \begin{cases} x^p \sin\frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ then f(x) is continuous but not differental at x = 0 if
(a) $0 < p \leq 1$ (b) $1 \leq p < \infty$
(c) $-\infty < p < 0$ (c) $p = 0$

122. Suppose $f: [2, 2] \to R$ is defined by
$f(x) = \begin{cases} -1 & \text{for } -2 \leq x \leq 0 \\ x - 1 & \text{for } 0 \leq x \leq 2 \end{cases}$
then $\{\in (-2, 2) : x \leq 0 \text{ and } f(|x|) = x\} =$
(a) {-1} (b) {0}
(c) {-1 /2} (d) ϕ

123. The value of the expression ${}^{47}C_4 + \sum {}^{52-j}C_3$ is equal to
(a) ${}^{47}C_5$ (b) ${}^{52}C_5$
(c) ${}^{52}C_4$ (b) none of these

124. A rectangle with sides of length (2m -1) and (2n - 1) units is divided into squares of unit length by drawing parallel lines as shown in the diagram, then the number of rectangles possible with odd side lengths is



(a) $(m + n - 1)^2$ (b) 4^{m+n-1}
(c) $m^2 n^2$ (b) $m(m+1)n(n+1)$

125. 7 relatives of a man comprises 4 ladies and 3 gentlemen ; his wife has also 7 relatives ; 3 of them are ladies and 4 gentlemen. In how many ways can they invite a dinner man's relatives and 3 of the wife's relatives?
(a) 845 (b) 485
(c) 548 (d) 458

126. If total number of runs scored in n matches is $\left(\frac{n+1}{4}\right)(2^{n+1} - n - 2)$ where $n > 1$, and the runs scored in the k^{th} match are given by $k \cdot 2^{n+1-k}$, where $1 \leq k \leq n$. Find n.
(a) 3 (b) 5
(c) 9 (d) 7

127. When $x > 0$, then $\int \cos^{-1}\left(\frac{1 - x^2}{1 + x^2}\right) dx$ is
(a) $2[x \tan^{-1} x - \log(1+x^2)] + c$
(b) $2[x \tan^{-1} x + \log(1+x^2)] + c$
(c) $2x \tan^{-1} x + \log(1+x^2)] + c$
(d) $2x \tan^{-1} x - \log(1+x^2)] + c$

128. If $\int \frac{e^x (1+\sin x)dx}{1 + \cos x} = e^x f(x) + c$, then f(x) =
(a) $\sin\frac{x}{2}$ (b) $\cos\frac{x}{2}$
(c) $\tan\frac{x}{2}$ (a) $\log\frac{x}{2}$

129. $\int e^{\tan^{-1}x}\left(\frac{1 + x + x^2}{1 + x^2}\right) dx$ is equal to
(a) $xe^{\tan^{-1}x} + c$ (b) $x^2 e^{\tan^{-1}x} + c$
(c) $\frac{1}{x} e^{\tan^{-1}x} + c$ (d) None of these

130. If $\int \frac{(2x^2 + 1)\,dx}{(x^2 - 4)(x^2 - 1)} \log\left[\left(\frac{x+1}{x-1}\right)^a \left(\frac{x-2}{x+2}\right)^b\right] + C$, then the values of a and b are respectively

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(a) 1/2, 3/4 (b) -1, 3/2
(c) 1, 3/2 (d) -1/2, 3/4

131. $\int \sqrt{1+\text{cosec}x}\, dx =$

(a) $\sin^{-1}(2\sin x + 1) + C$
(b) $-\sin^{-1}(2\sin x - 1) + C$
(c) $\sin^{-1}(2\sin x - 1) + C$
(d) none of these

132. The differential equation whose solution is $y = A\sin x + B\cos x$, is

(a) $\frac{d^2y}{dx^2} + y = 0$ (b) $\frac{d^2y}{dx^2} - y = 0$

(c) $\frac{dy}{dx} + y = 0$ (b) None of these

133. if $\left(\frac{2+\sin x}{1+y}\right)\frac{dy}{dx} = -\cos x$, $y(0)=1$, then $y\left(\frac{\pi}{2}\right) =$

(a) 1 (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) $\frac{1}{4}$

134. If $xdy = y(dx + ydy)$, $y > 0$ and $y(1) = 1$, then $y(-3)$ is equal to
(a) 1 (b) 3
(c) 5 (d) -1

135. A normal is drawn at a point P (x, y) of a curve. It meets the x-axis at Q. If PQ is of constant length k, then the differential equation describing such a curve is

(a) $y\frac{dy}{dx} = \pm\sqrt{k^2 - y^2}$ (b) $y\frac{dy}{dx} = \pm\sqrt{k^2 - x^2}$

(c) $y\frac{dy}{dx} = \pm\sqrt{k^2 - k^2}$ (d) $x\frac{dy}{dx} = \pm\sqrt{x^2 - k^2}$

136. The differential equation of the family of parabolas with focus at the origin and the x-axis as axis is

(a) $y\left(\frac{dy}{dx}\right)^2 + 4x\frac{dy}{dx} = 4y$

(b) $-y\left(\frac{dy}{dx}\right)^2 = 2x\frac{dy}{dx} - y$

(c) $y\left(\frac{dy}{dx}\right)^2 + y = 2xy\frac{dy}{dx}$

(d) $y\left(\frac{dy}{dx}\right)^2 + 2xy\frac{dy}{dx} + y = 0$

137. If α, β, γ be the angles which a line makes with the positive direction of co-ordinate axes, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$
(a) 2 (b) 1
(c) 3 (d) 0

138. The equation of the sphere conectric with the sphere $2x^2 + 2y^2 + 2z^2 - 6x + 2y - 4z = 1$ and double its radius is
(a) $x^2 + y^2 + z^2 - 6x + 2y - 4z = 1$
(b) $2x^2 + 2y^2 + 2z^2 - 6x + 2y - 4z - 15 = 0$
(c) $x^2 + y^2 + z^2 - 3x + y - 2z = 1$
(d) $2x^2 + 2y^2 + 2z^2 - 6x + 2y - 4z - 25 = 1$

139. If the tangent at the point P on the circle $x^2 + y^2 + 6x + 6y = 2$ meets a straight line $5x - 2y + 6 = 0$ at a point Q on the y - axis then the length of PQ is
(a) 4 (b) $2\sqrt{5}$
(c) 5 (d) $3\sqrt{5}$

140. Consider a family of circles passing through two fixed points A (3, 7) and B (6, 5). Show that the chords in which the circle $x^2 + y^2 - 4x - 6y - 3 = 0$ cuts the members of the family are concurrent at a point . Find the coordinate of this point.

(a) $\frac{23}{3}, 2$ (b) $2, \frac{23}{3}$

(c) $3, \frac{23}{3}$ (d) None of these

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141. Circles with radii 3, 4 and 5 touch each other externally. If P is the point of intersection of tangents to these circles at their points of contact, find the distance of P from the points of contact
(a) $\sqrt{3}$ (b) $\sqrt{5}$
(c) $\sqrt{7}$ (d) None of these

142. The lines $2x - 3y = 5$ and $3x - 4y = 7$ are diameters of circle of area 154 sq. units, Then the equation of this circle is
(a) $x^2+y^2+2x-2y=62$
(b) $x^2+y^2+2x-2y=47$
(c) $x^2+y^2-2x+2y=47$
(d) $x^2+y^2-2x+2y=62$

143 The angle between two diagonals of a cube will be
(a) $\sin^{-1} 1/3$ (b) $\cos^{-1} 1/3$
(c) Variable (d) None of these

144. The ratio in which the line joining the points (a, b, c) and (-a, -c, -b) is divided by the xy-plane is
(a) a : b (b) b : c
(c) c : a (d) c : b

145. A variable plane at a distance of the one unti from the origin cuts the cordinates axes at A, B and C. If the centroid D (x, y, z) of triangle ABC satisfies the relation $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=k$, then the value k is
(a) 3 (a) 1
(c) $\frac{1}{3}$ (d) 9

146. The point D, E, F divide BC, CA and AB of the triangle ABC in the ratio 1 : 4, 3 : 2 and 3 : 7 respectively and the point K divides AB in the ration 1 :3. then $(\vec{AD}+\vec{BE}+\vec{CF}) : \vec{CK}$ is equal to
(a) 1 : 1 (b) 2 : 5
(c) 5 : 2 (d) None of these

147. In a test an examine either guesses or copies or knows the answer to a multiple choice question with four choice. The probability that he make a guess is 1/3, and the probability that he copies the answer is 1/6,The probability that his answer is correct given that he copied it, is 1/8. Find the probability that he knew the answer to the question given that he correctly answered it.
(a) $\frac{29}{24}$ (b) $\frac{24}{29}$
(c) $\frac{29}{42}$ (b) None of these

148. In a multiple-choice question there are four alternative answers, of which one or more are correct. A candidate will get marks in the question only if he ticks the correct answer. The candidate decides to tick the answers at random, if he allowed upto three chances to answer the questions, find the probability that he will get marks in the questions.
(a) 1/5 (b) 5
(c) 4 (d) 3

149. Let $2\sin 2x + 3\sin x - 2 > 0$ and $x2 - x - 2 < 0$(x is measured in radians). Then x lies in the interval
(a) $\left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$ (b) $\left(-1, \frac{5\pi}{6}\right)$
(c) $\left(-1, 2\right)$ (d) $\left(\frac{\pi}{6}, 2\right)$

150. The value of
$$6+\log_{\frac{3}{2}}\left(\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}\sqrt{4-\frac{1}{3\sqrt{2}}}}}\right)\ldots\text{is}$$
(a) 3 (b) -3
(c) -5 (d) 4

SPACE FOR ROUGH WORK

ENGLISH

Instruction for Q. No. 151 to 160
Pick up the correct synonyms for each of the following words.

151. DISTINGUISH
(a) Darken (b)Abolish
(c) Differentiate (d)Confuse

152. UNIFORMITY
(a)Routine (b)Continuity
(c)Stability (d)Consistency

153. SUPERCILIOUS
(a)Indifferent (b) Annoyed
(c)Haughty (d) Angry

154. HANDSOME
(a)Noble (b)Gentle
(c)Good-looking (d)Polite

155. DYNAMIC
(a)Vigorous (b) Forceful
(c)Robust (d)Active

156. ALERT
(a)Smart (b)Active
(c)Watchful (d)Live

157. IDENTIFY
(a)Picture (b)Envision
(c)Notice (d)Recognize

158. PREROGATIVE
(a)Privilege (b)Request
(c)Desire (d) Command

159. SYNTHETIC
(a) Scientific (b) Fake
(c) Artificial (d) Superficial

160. AMBITION
(a)Plan (b)Proclamation
(c)Desire (d)Decision

Instruction for Q. No. 161 to 170
In each of the following questions choose the word possible in meaning to the given word.

161. PRECARIOUS
(a)Dangerous (b)Safe
(c)Cautious (d)Easy

162. ERUDITE
(a)Professional (b)Immature
(c)Unimaginative (d)Ignorant

163. TERRIBLE
(a)Horrible (b) Awesome
(c)Delightful (d) Hideous

164. PROHIBIT
(a)Accept (b)Permit
(c)Agree (d)Grant

165. FACT
(a)Fable (b)Story
(c)Illusion (d)Fiction

166. ROUGHLY
(a)Exactly (b)Completely
(c)Pointedly (d) Largely

167. ANTIPATHY
(a)Obedience (b) Admiration
(c)Agreement (d) Fondness

168. PACIFY
(a)Insult (b) Injure
(c)Offend (d)Aggravate

169. COMMEND
(a)Suspend (b)Admonish
(c)Hate (d)Dislike

170. GRIM
(a)Serious (b)Satisfying
(c)Delightful (d)Painful

Instruction for Q. No. 171 to 180
Pick out the most effective word from the given word to fill in the blank to make the sentence meaning fully complete.

171. Some people....themselves into believing that they are indispensable to the organisation they work for.
(a)keep (b)fool
(c)denigrate (d)delude

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172. His interest in the study of human behavior is indeed very ……..
(a)strong (b)large
(c)broad (d)deep

173. The improvement made by changes in the system was ……and did not warrant the large expenses
(a)large (b)small
(c)minute (d) marginal

174. There has been a ……..lack of efficiency in all the crucial areas of the working of public sector undertakings.
(a)positive (b) surprising
(c)conspicuous (d) simulative

175. Two of the fugitives managed to remain free by adeptly avoiding the…..of the police
(a) torture (b) pursuit
(c) discovery (d) following

176. Man power is the…….means of converting other resources to mankind's use and benefit
(a)insuperable (b)inimitable
(c)indivisible (d)indispensable

177. Rights …… automatically to him who duly performs his duties
(a)belong (b) transfer
(c)accrue (d) acquire

178. How much did it ……. To reach Bombay by carϙ
(a)charge (b)price
(c)cost (d)estimate

179. Ever one should ……. himself again illness since medical care has now become expensive.
(a) vaccinate (b) insure
(c) brace (d) ensure

180. The teacher ordered kamal to leave the room and ……..him to return.
(a) stopped (b) refused
(c) forbade (d) challenged

Instruction for Q. No. 181 to 185. Tick mark the choice that is similar to question in relationship between the word given.

181. renovation : renewal
(a)fail : examination (b)tumble : topple
(c) poor : poverty (d)du : climb

182. bush : flora
(a)plant : fauna (b)borse : carriage
(c)fish : water (d)blue colour

183. heavy : light
(a)loop hole : fool-proof
(b)weight : bulb
(c)dark : night
(d)water : fire

184. book : page
(a)parliament : minister
(b)rope : fibre
(c)ship : wood
(d)star space

185. examination:degree
(a)doctor : Ph.d
(b)music : instrument
(c)interview : selection
(d)sports : medal

General knowledge.

186. In the year (2003) the chemistry Nobel Prize was awarded to the following work.
(a)aquaporins
(b)Na^{++} channels
(c)Ca^{++} channels
(d)methyl chavicol.

187. Rayon fibre is manufactured from
(a) petroleum (b) wood and pulp
(c) chemicals (d) napntha.

188. Where is 'Indira Gandhi Rashtriya Uran Akadimi' situatedϙ
(a) Dehradun (b) Raebareli
(c) Allahabad (d) Mussorrie.

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189. National Inland Navigation Institute (NINI) is situated in :
(a) Patna (b) Kolkata
(c) Goa (d) Gomukh, Uttaranchal.

190. Which of the following is President A.P.J. Adbul Kalam's autobiographyϕ
(a) Wings of fire
(b) Crossroads
(c) Ignited Minds: Unleashing the Power Within India
(d) My experiment with truth.

191. X-ray were discovered by
(a) Wilhelm K. Roentgen
(b) H. Kissinger
(c) Sir C.V. Raman
(d) Meghnad Saha

192. Ecology deals with
(a) the earth and planets
(b) the relationship between organism and their environment
(c) the life under the sea
(d) economical growth of poor people

193. Which is an ore of aluminiumϕ
(a) chromite (b) cuprite
(c) bauxite (d) siderite

194. Horns. nails and hair are
(a) soluble fats
(b) insoluble carbohydrates
(c) keratin proteins
(d) complex lipids

195. When was song 'Jana gana mana' adopted as the National Anthem of Indiaϕ
(a) 14th August 1947
(b) 24th January 1950
(c) 15th August 1947
(d) 26th January 1950

196. In which country the 'Dogs' were once worshipped as 'Gods'ϕ
(a) Egypt (b) Greece
(c) Italy (d) Mangolia

197. Which German physicist invented the electron microscope which won him the 1986 Nobel Prize in Physics ϕ
(a) Ernst Ruska (b) Van't Hoff
(c) J.H.D. Jensen (d) Eugene P. Wigner

198. Positron emission tomography (PET) is one of the best methods for functional imaging because :
(a) isotopes of basic body elements are used for imaging
(b) istopes with long half-lives are used
(c)isotopes with short half-lives are used
(d) positrons are directly involved used in imaging.

199. The great Fisher Bank is situated off
(a) the coast of New Fundland
(b) the Chilean coast
(c) the Spanish coast
(d) the coast of Great Britain.

200. Since the Brisishers wanted India to produce and supply raw materials to feed English factories, they pushed a policy that encouraged cultivation of
(a) Jute
(b) indigo
(c) cotton
(d) commercial crops.

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