Q1. Two forces are such that the sum of their magnitudes is 18 N and their resultant is 12 N which is perpendicular to the smaller force. Then the magnitudes of the forces are

(1) 12 N, 6 N
(2) 13 N, 5 N
(3) 10 N, 8 N
(4) 16 N, 2 N

Q2. Identify the pair whose dimensions are equal

(1) torque and work
(2) stress and energy
(3) force and stress
(4) force and work

Q3. From a building two balls A and B are thrown such that A is thrown upwards A and B downwards (both vertically). If v_A and v_B are their respective velocities on reaching the ground, then

(1) $V_B > V_A$
(2) $V_A = V_B$
(3) $V_A > V_B$
(4) their velocities depend on their masses

Q4. If a body looses half of its velocity on penetrating 3 cm in a wooden block, then how much will it penetrate more before coming to rest?

(1) 1 cm
(2) 2 cm
(3) 3 cm
(4) 4 cm

Q5. Speeds of two identical cars are u and $4u$ at the specific instant. The ratio of the respective distances in which the two cars are stopped from that instant is

(1) 1 : 1
(2) 1 : 4
(3) 1 : 8
(4) 1 : 16

Q6. The minimum velocity (in ms^{-1}) with which a car driver must traverse a flat curve of radius 150 m and coefficient of friction 0.6 to avoid skidding is

(1) 60
(2) 30
(3) 15
(4) 25

Q7. A lift is moving down with acceleration a. A man in the lift drops a ball inside the lift. The acceleration of the ball as observed by the man in the lift and a man standing stationary on the ground are respectively

(1) g, g
(2) g - a, g - a
(3) g - a, g
(4) a, g

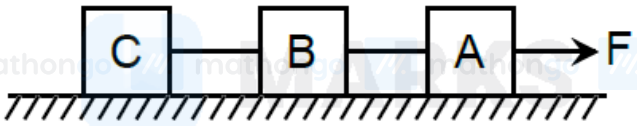
Q8. When forces F_1, F_2, F_3 are acting on a particle of mass m such that F_2 and F_3 are mutually perpendicular, then the particle remains stationary. If the force F_1 is now removed then the acceleration of the particle is

(1) F_1/m
(2) $F_2 F_3/mF_1$
(3) $(F_2 - F_3)/m$
(4) F_2/m

Q9. A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (vertically). If the acceleration of the system is $g/8$, then the ratio of the masses is

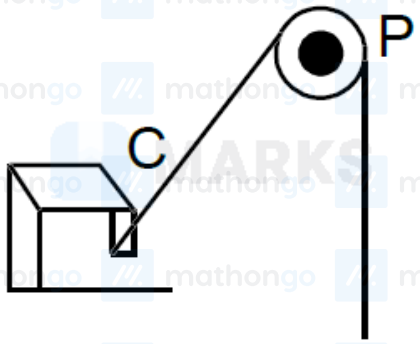
(1) 8 : 1
(2) 9 : 7
(3) 4 : 3
(4) 5 : 3

Q10. Three identical blocks of masses $m = 2$ kg are drawn by a force $F = 10.2$ N with an acceleration of 0.6 ms^{-2} on a frictions surface, then what is the tension (in N) in the string between the blocks B and C?



(1) 9.2
(2) 7.8
(3) 4
(4) 9.8

Q11. One end of a massless rope, which passes over a massless and frictionless pulley P is tied to a hook C while the other end is free. Maximum tension that the rope can bear is 360 N. With what value of maximum safe



acceleration (in ms^{-2}) can a man of 60 kg climb on the rope?
(1) 16
(2) 6
(3) 4
(4) 8

Q12. A bead of weight w can slide on smooth circular wire in a vertical plane. The bead is attached by a light thread to the highest point of the wire and in equilibrium, the thread is taut and make an angle θ with the vertical then tension of the thread and reaction of the wire on the bead are
(1) $T = w\cos\theta \quad R = w\tan\theta$
(2) $\mathrm{T} = 2\mathrm{w}\cos\theta \quad \mathrm{R} = \mathrm{w}$
(3) $\mathrm{T} = \mathrm{w} \quad \mathrm{R} = \mathrm{w}\sin\theta$
(4) $T = w\sin\theta \quad R = w\cot\theta$

Q13. A spring of force constant 800 $\mathrm{N/m}$ has an extension of 5 cm. The work done is extending it from 5 cm to 15 cm is
(1) 16 J option 1 goes here
(2) 8 J
(3) 32 J
(4) 24 J

Q14. A ball whose kinetic energy is E, is projected at an angle of 45° to the horizontal. The kinetic energy of the ball at the highest point of its flight will be
(1) E
(2) $\mathrm{E}/\sqrt{2}$
(3) $E/2$
(4) zero

Q15. Two identical particles move towards each other with velocity $2v$ and v respectively. The velocity of centre of mass is
(1) v
(2) v/3
(3) v/2
(4) zero

Q16. Initial angular velocity of a circular disc of mass M is ω_1. Then two small spheres of mass m are attached gently to diametrically opposite points on the edge of the disc. What is the final angular velocity of the disc?

(1) $\left(\frac{M+m}{M}\right)\omega_1$ (2) $\left(\frac{\mathrm{M+m}}{\mathrm{m}}\right)\omega_1$

(3) $\left(\frac{\mathrm{M}}{\mathrm{M+4\,m}}\right)\omega_1$ (4) $\left(\frac{M}{M+2m}\right)\omega_1$

Q17. A solid sphere, a hallow sphere and a ring are released from top of an inclined plane (frictionless) so that they slide down the plane. Then maximum acceleration down the plane is for (no rolling)

(1) solid sphere (2) hollow sphere

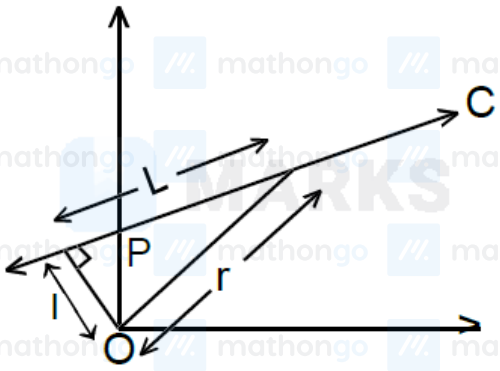
(3) ring (4) all same

Q18. Moment of inertia of a circular wire of mass M and radius R about its diameter is

(1) $\mathrm{MR}^2/2$ (2) MR^2

(3) $2\mathrm{MR}^2$ (4) $\mathrm{MR}^2/4$

Q19. A particle of mass m moves along line PC with velocity v as shown. What is the angular momentum of the



particle about P?

(1) mvL (2) mvl

(3) mvr (4) zero

Q20. The kinetic energy needed to project a body of mass m from the earth surface (radius R) to infinity is

(1) $\mathrm{mgR}/2$ (2) $2\mathrm{mgR}$

(3) mgR (4) $\mathrm{mgR}/4$

Q21. If suddenly the gravitational force of attraction between Earth and a satellite revolving around it becomes zero, then the satellite will

(1) continue to move in its orbit with same velocity (2) move tangentially to the originally orbit in the same velocity

(3) become stationary in its orbit (4) move towards the earth.

Q22. Energy required to move a body of mass m from an orbit of radius 2R to 3R is

(1) $\mathrm{GMm}/12\mathrm{R}^2$ (2) $\mathrm{GMm}/3\mathrm{R}^2$

(3) $\mathrm{GMm}/8\mathrm{R}$ (4) $\mathrm{GMm}/6\mathrm{R}$

Q23. The escape velocity of a body depends upon mass as

(1) m^0 (2) m^1

(3) m^2 (4) m^3

Q24. A cylinder of height 20 m is completely filled with water. The velocity of efflux of water (in ms^{-1}) through a small hole on the side wall of the cylinder near its bottom is

(1) 10 (2) 20
(3) 25.5 (4) 5

Q25. Heat given to a body which raises its temperature by $1^{\circ}C$ is

(1) water equivalent (2) thermal capacity
(3) specific heat (4) temperature gradient

Q26. Which of the following is more closed to a black body?

(1) black board paint (2) green leaves
(3) black holes (4) red roses

Q27. Two spheres of the same material have radii 1 m and 4 m and temperatures 4000 K and 2000 K respectively. The ratio of the energy radiated per second by the first sphere to that by the second is

(1) 1 : 1 (2) 16 : 1
(3) 4 : 1 (4) 5 : 3

Q28. If θ_i, is the inversion temperature, θ_n is the neutral temperature, θ_c is the temperature of the cold junction, then

(1) $\theta_i + \theta_c = \theta_n$ (2) $\theta_{\mathrm{i}} - \theta_c = 2\theta_n$
(3) $\frac{\theta_i + \theta_c}{2} = \theta_n$ (4) $\theta_c - \theta_i = 2\theta_n$

Q29. Which statement is incorrect?

(1) all reversible cycles have same efficiency (2) reversible cycle has more efficiency than an irreversible one
(3) Carnot cycle is a reversible one (4) Carnot cycle has the maximum efficiency in all cycles

Q30. Even Carnot engine cannot give 100% efficiency because we cannot

(1) prevent radiation (2) find ideal sources
(3) reach absolute zero temperature (4) eliminate friction

Q31. Cooking gas containers are kept in a lorry moving with uniform speed. The temperature of the gas molecules inside will

(1) increase (2) decrease
(3) remain same (4) decrease for some, while increase for others

Q32. At what temperature is the r.m.s. velocity of a hydrogen molecule equal to that of an oxygen molecule at $47^{\circ}C$?

(1) 80 K (2) 73 K
(3) 3 K (4) 20 K

Q33. 1 mole of a gas with $\gamma = 7/5$ is mixed with 1 mole of a gas with $\gamma = 5/3$, then the value of γ for the resulting mixture is

(1) 7/5 (2) 2/5
(3) 24/16 (4) 12/7

Q34. In a simple harmonic oscillator, at the mean position
(1) kinetic energy is minimum, potential energy is maximum
(2) both kinetic and potential energies are maximum
(3) kinetic energy is maximum, potential energy is minimum
(4) both kinetic and potential energies are minimum

Q35. If a spring has time period T, and is cut into n equal parts, then the time period of each part will be
(1) $\mathrm{T}\sqrt{\mathrm{n}}$
(2) $\mathrm{T}/\sqrt{\mathrm{n}}$
(3) nT
(4) T

Q36. A child swinging on a swing in sitting position, stands up, then the time period of the swing will
(1) increase
(2) decrease
(3) remains same
(4) increases if the child is tall and decreases if the child is short

Q37. Length of a string tied to two rigid supports is 40 cm. Maximum length (wave length in cm) of a stationary wave produced on it is
(1) 20
(2) 80
(3) 40
(4) 120

Q38. Tube A has both ends open while tube B has one end closed, otherwise they are identical. The ratio of fundamental frequency of tube A and B is
(1) 1 : 2
(2) 1 : 4
(3) 2 : 1
(4) 4 : 1

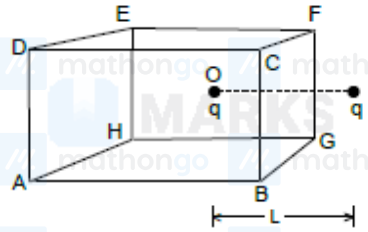
Q39. A tuning fork arrangement (pair) produces 4 beats / sec with one fork of frequency 288cps. A little wax is placed on the unknown fork and it then produces 2 beats /sec. The frequency of the unknown fork is
(1) 286 cps
(2) 292 cps
(3) 294 cps
(4) 288 cps

Q40. A wave $y = a\sin(\omega t - kx)$ on a string meets with another wave producing a node at $x = 0$. Then the equation of the unknown wave is
(1) $y = a\sin(\omega t + kx)$
(2) $y = -a\sin(\omega t + kx)$
(3) $\mathrm{y} = \mathrm{a}\sin(\omega\mathrm{t} - \mathrm{kx})$
(4) $\mathrm{y} = -\mathrm{a}\sin(\omega\mathrm{t} - \mathrm{kx})$

Q41. When temperature increases, the frequency of a tuning fork
(1) increases
(2) decreases
(3) remains same
(4) increases or decreases depending on the material

Q42. On moving a charge of 20 coulombs by $2\ \mathrm{cm}$, $2\ \mathrm{J}$ of work is done, then the potential difference between the points is
(1) 0.1 V
(2) 8 V
(3) 2 V
(4) 0.5 V

Q43. A charged particle q is placed at the centre O of cube of length L (A B C D E F G H). Another same charge q is



placed at a distance L from O. Then the electric flux through $ABCD$ is

(1) $q/4\pi\epsilon_0 L$ (2) zero

(3) $\mathrm{q}/2\pi\epsilon_0 L$ (4) $q/3\pi\epsilon_0 L$

Q44. If a charge q is placed at the centre of the line joining two equal charges Q such that the system is in equilibrium then the value of q is

(1) $Q/2$ (2) $-Q/2$

(3) $\mathrm{Q}/4$ (4) $-Q/4$

Q45. If there are n capacitors in parallel connected to V volt source, then the energy stored is equal to

(1) CV (2) $\frac{1}{2}\mathrm{nCV}^2$

(3) CV^2 (4) $\frac{1}{2n}CV^2$

Q46. Capacitance (in F) of a spherical conductor with radius 1 m is

(1) 1.1×10^{-10} (2) 10^{-6}

(3) 9×10^{-9} (4) 10^{-3}

Q47. If an ammeter is to be used in place of a voltmeter, then we must connect with the ammeter a

(1) low resistance in parallel (2) high resistance in parallel

(3) high resistance in series (4) low resistance in series

Q48. A wire when connected to 220 V mains supply has power dissipation P_1. Now the wire is cut into two equal pieces which are connected in parallel to the same supply. Power dissipation in this case is P_2 Then $P_2 : P_1$ is

(1) 1 (2) 4

(3) 2 (4) 3

Q49. If a current is passed through a spring then the spring will

(1) expand (2) compress

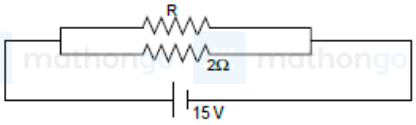
(3) insulator (4) none of these

Q50. By increasing the temperature, the specific resistance of a conductor and a semiconductor

(1) increases for both (2) decreases for both

(3) increases, decreases (4) decreases, increases

Q51.



If in the circuit, power dissipation is 150 W, then R is

(1) 2Ω (2) 6Ω

(3) 5Ω (4) 4Ω

Q52. If in a circular coil A of radius R, current I is flowing and in another coil B of radius $2R$ a current 2I is flowing, then the ratio of the magnetic fields B_A and B_B, produced by them will be

(1) 1 (2) 2

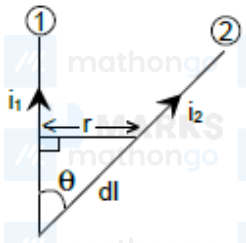
(3) 1/2 (4) 4

Q53. If an electron and a proton having same momenta enter perpendicular to a magnetic field, then

(1) curved path of electron and proton will be same (ignoring the sense of revolution) (2) they will move undeflected

(3) curved path of electron is more curved than that of the proton (4) path of proton is more curved

Q54. Wires 1 and 2 carrying currents i_1 and i_2 respectively are inclined at an angle θ to each other. What is the force on a small element dl of wire 2 at a distance of r from wire 1 (as shown in the figure) due to the magnetic field



of wire 1 ?

(1) $\frac{\mu_0}{2\pi r} i_1 i_2 dl \tan\theta$ (2) $\frac{\mu_0}{2\pi r} i_1 i_2 \, dl \sin\theta$

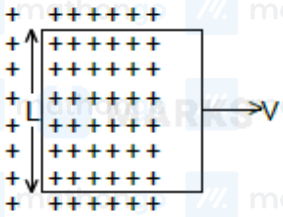
(3) $\frac{\mu_0}{2\pi r} i_1 i_2 dl \cos\theta$ (4) $\frac{\mu_0}{4\pi r} i_1 i_2 dl \sin\theta$

Q55. The time period of a charged particle undergoing a circular motion in a uniform magnetic field is independent of its

(1) speed (2) mass

(3) charge (4) magnetic induction

Q56. A conducting square loop of side L and resistance R moves in its plane with a uniform velocity v perpendicular to one of its sides. A magnetic induction B constant in time and space, pointing perpendicular and into the plane at the loop exists everywhere with half the loop outside the field, as shown in figure. The

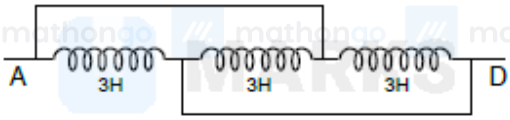


induced emf is

(1) zero (2) RvB

(3) VBL/R (4) VBL

Q57.



The inductance between A and D is

(1) 3.66 H (2) 9 H

(3) 0.66 H (4) 1 H

Q58. The mass of product liberated on anode in an electrochemical cell depends on (where t is the time period, for which the current is passed)

(1) $(\mathrm{It})^{1/2}$ (2) IT

(3) I/t (4) $\mathrm{I}^2\mathrm{t}$

Q59. The power factor of an AC circuit having resistance (R) and inductance (L) connected in series and an angular velocity ω is

(1) $\mathrm{R}/\omega\mathrm{L}$ (2) $\mathrm{R}/\left(\mathrm{R}^2+\omega^2L^2\right)^{1/2}$

(3) $\omega\mathrm{L}/\mathrm{R}$ (4) $R/\left(R^2-\omega^2L^2\right)^{1/2}$

Q60. In a transformer, number of turns in the primary coil are 140 and that in the secondary coil are 280. If current in primary coil is 4 A, then that in the secondary coil is

(1) 4 A (2) 2 A

(3) 6 A (4) 10 A

Q61. Electromagnetic waves are transverse in nature is evident by

(1) polarization (2) interference

(3) reflection (4) diffraction

Q62. Infra red radiation is detected by

(1) spectrometer (2) pyrometer

(3) nanometer (4) photometer

Q63. Which of the following are not electromagnetic waves?

(1) cosmic rays (2) gamma rays

(3) β-rays (4) X- rays

Q64. An astronomical telescope has a large aperture to

(1) reduce spherical aberration (2) have high resolution

(3) increase span of observation (4) have low dispersion

Q65. If two mirrors are kept at 60° to each other, then the number of images formed by them is

(1) 5 (2) 6

(3) 7 (4) 8

Q66. Which of the following is used in optical fibres ?

(1) total internal reflection (2) scattering

(3) diffraction (4) refraction

Q67. Wavelength of light used in an optical instrument are $\lambda_1 = 4000\mathring{A}$ and $\lambda_2 = 5000\mathring{A}$, then ratio of their respective resolving powers (corresponding to λ_1 and λ_2) is

(1) 16 : 25 (2) 9 : 1

(3) 4 : 5 (4) 5 : 4

Q68. Sodium and copper have work functions 2.3eV and 4.5eV respectively. Then the ratio of the wave lengths is nearest to

(1) 1 : 2 (2) 4 : 1
(3) 2 : 1 (4) 1 : 4

Q69. Formation of covalent bonds in compounds exhibits
(1) wave nature of electron (2) particle nature of electron
(3) both wave and particle nature of electron (4) none of these

Q70. If 13.6eV energy is required to ionize the hydrogen atom, then the energy required to remove an electron from $n = 2$ is
(1) 10.2eV (2) 0eV
(3) 3.4eV (4) 6.8eV

Q71. At a specific instant emission of radioactive compound is deflected in a magnetic field. The compound can emit (i) electrons (ii) protons (iii) He^{2+} (iv) neutrons The emission at instant can be
(1) i, ii, iii (2) i, ii, iii, iv
(3) iv (4) ii, iii

Q72. If N_0 is the original mass of the substance of half- life period $t_{1/2} = 5$ years, then the amount of substance left after 15 years is
(1) $N_0/8$ (2) $N_0/16$
(3) $N_0/2$ (4) $N_0/4$

Q73. If mass-energy equivalence is taken into account, when water is cooled to form ice, the mass of water should
(1) increase (2) remain unchanged
(3) decrease (4) first increase then decrease

Q74. At absolute zero, Si acts as
(1) non metal (2) metal
(3) insulator (4) none of these

Q75. The energy band gap is maximum in
(1) metals (2) superconductors
(3) insulators (4) semiconductors

Q76. The part of a transistor which is most heavily doped to produce large number of majority carriers is
(1) emmiter (2) base
(3) collector (4) can be any of the above three

Q77. In a compound C, H and N atoms are present in 9 : 1 : 35 by weight. Molecular weight of compound is 108. Molecular formula of compound is
(1) $C_2H_6N_2$ (2) C_3H_4N
(3) $C_6H_8N_2$ (4) $C_9H_{12}N_3$

Q78. Number of atoms in 558.5 gram Fe (at.wt. of Fe $= 55.85$ g mol^{-1}) is
(1) twice that in 60 g carbon (2) 6.023×10^{22}
(3) half that in 8g He (4) $558.5 \times 6.023 \times 10^{23}$

Q79. In a hydrogen atom, if energy of an electron in ground state is 13.6 eV, then that in the 2nd excited state is

(1) 1.51 eV (2) 3.4 eV
(3) 6.04 eV (4) 13.6 eV

Q80. Uncertainity in position of a minute particle of mass 25 g in space is 10^{-5} m. What is the uncertainity in its velocity (in ms^{-1})? $\left(h = 6.6 \times 10^{-34} Js\right)$
(1) 2.1×10^{-34} (2) 0.5×10^{-34}
(3) 2.1×10^{-28} (4) 0.5×10^{-23}

Q81. β - particle is emitted in radioactivity by
(1) conversion of proton to neutron (2) from outermost orbit
(3) conversion of neutron to proton (4) β-particle is not emitted

Q82. In which of the folloiwng species the interatomic bond angle is $109^{\circ}28'$?
(1) $NH_3, (BF_4)^{-1}$ (2) $(NH_4)^{+}, BF_3$
(3) NH_3, BF_4 (4) $(NH_2)^{-1}, BF_3$

Q83. Which of the following are arranged in an increasing order of their bond strengths ?
(1) $O_2^- < O_2 < O_2^+ < O_2^{2-}$ (2) $O_2^{2-} < O_2^- < O_2 < O_2^+$
(3) $O_2^- < O_2^{2-} < O_2 < O_2^+$ (4) $O_2^+ < O_2 < O_2^- < O_2^{2-}$

Q84. Which of the following statements is true ?
(1) HF is less polar than HBr (2) absolutely pure water does not contain any ions
(3) chemical bond formation take place when forces of attraction overcome the forces of repulsion (4) in covalency transference of electron takes place

Q85. For an ideal gas, number of moles per litre in terms of its pressure P, gas contant R and temperature T is
(1) PT/R (2) PRT
(3) P/RT (4) RT/P

Q86. Value of gas constant R is
(1) 0.082 litre atm (2) 0.987cal mol^{-1} K^{-1}
(3) 8.3 J mol^{-1} K^{-1} (4) 83 erg mol^{-1} K^{-1}

Q87. Kinetic theory of gases proves
(1) only Boyle's law (2) only Charles' law
(3) only Avogadro's law (4) all of these

Q88. If an endothermic reaction is non- spantaneous at freezing point of water and becomes feasible at its boiling point, then
(1) ΔH is - ve, ΔS is + ve (2) ΔH and ΔS both are + ve
(3) ΔH and ΔS both are $-$ ve (4) ΔH is + ve, ΔS is $-$ve

Q89. A heat engine absorbs heat Q_1 at temperature T_1 and heat Q_2 at temperature T_2. Work done by the engine is $J(Q_1 + Q_2)$. This data
(1) violates 1^{st} law of thermodynamics (2) violates 1^{st} law of thermodynamics if Q_1 is $-ve$
(3) violates 1^{st} law of thermodynamics if Q_2 is $-$ ve (4) does not violate 1^{st} law of thermodynamics

Q90. The heat required to raise the temperature of body by 1 K is called

(1) specific heat (2) thermal capacity
(3) water equivalent (4) none of these

Q91. Change in volume of the system does not alter the number of moles in which of the following equilibria ?
(1) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ (2) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
(3) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ (4) $SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g)$

Q92. In which of the following reactions, increase in the volume at constant temperature does not affect the number of moles at equilibrium
(1) $2NH_3 \rightarrow N_2 + 3H_2$ (2) $C(g) + (1/2)O_2(g) \rightarrow CO(g)$
(3) $H_2(g) + O_2(g) \rightarrow H_2O_2(g)$ (4) none of these

Q93. For the reaction $CO(g) + (1/2)O_2(g) = CO_2(g), K_p/K_c$ is
(1) RT (2) $(RT)^{-1}$
(3) $(RT)^{-1/2}$ (4) $(RT)^{1/2}$

Q94. 1 M NaCl and 1 M HCl are present in an aqueous solution. The solution is
(1) not a buffer solution with pH < 7 (2) not a buffer solution with pH > 7
(3) a buffer solution with pH < 7 (4) a buffer solution with pH > 7

Q95. Species acting as both Bronsted acid and base is
(1) $(HSO_4)^{-1}$ (2) Na_2CO_3
(3) NH_3 (4) OH^{-1}

Q96. Let the solubility of an aqueous solution of $Mg(OH)_2$ be x then its k_{sp} is
(1) $4x^3$ (2) $108x^5$
(3) $27x^4$ (4) $9x$

Q97. The solubility of $Mg(OH)_2$ is S moles/litre. The solubility product under the same condition is
(1) $4\ S^3$ (2) $3S^4$
(3) $4\ S^2$ (4) S^3

Q98. How do we differentiate between Fe^{3+} and Cr^{3+} in group III?
(1) by taking excess of NH_4OH solution (2) by increasing $NH_4{}^+$ion concentration
(3) by decreasing OH^-ion concentration (4) both (b) and (c)

Q99. For the reactions, $C + O_2 \longrightarrow CO_2; \Delta H = -393\ J\ 2Zn + O_2 \longrightarrow 2ZnO; \Delta H = -412\ J$
(1) carbon can oxidise Zn (2) oxidation of carbon is not feasible
(3) oxidation of Zn is not feasible (4) Zn can oxidise carbon

Q100. Which of the following is a redox reaction ?
(1) $NaCl + KNO_3 \rightarrow NaNO_3 + KCl$ (2) $CaC_2O_4 + 2HCl \rightarrow CaCl_2 + H_2C_2O_4$
(3) $Mg(OH)_2 + 2NH_4Cl \rightarrow MgCl_2 + 2NH_4OH$ (4) $Zn + 2AgCN \rightarrow 2Ag + Zn(CN)_2$

Q101. KO_2 (potassium super oxide) is used in oxygen cylinders in space and submarines because it
(1) absorbs CO_2 and increases O_2 content (2) eliminates moisture
(3) absorbs CO_2 (4) produces ozone.

Q102. A metal M readily forms its sulphate MSO_4 which is water - soluble. It forms its oxide MO which becomes inert on heating. It forms an insoluble hydroxide $M(OH)_2$ which is soluble in NaOH solution. Then M is

(1) Mg (2) Ba

(3) Ca (4) Be

Q103. Alum helps in purifying water by

(1) forming Si complex with clay particles (2) sulphate part which combines with the dirt and removes it

(3) coagulating the mud particles (4) making mud water soluble

Q104. Arrangement of $(CH_3)_3 - C-, (CH_3)_2 - CH-, CH_3 - CH_2$ - when attached to benzyl or an unsaturated group in increasing order of inductive effect is

(1) $(CH_3)_3 - C- < (CH_3)_2 - CH- < CH_3 - CH_2$ (2) $CH_3 - CH_2- < (CH_3)_2- < CH- < (CH_3)_3 - C-$

(3) $(CH_3)_2 - CH- < (CH_3)_3 - C- < CH_3, -CH_2$ (4) $(CH_3)_3 - C- < CH_3 - CH_2 - (CH_3)_2 - CH-$

Q105. A similarity between optical and geometrical isomerism is that

(1) each forms equal number of isomers for a given compound (2) If in a compound one is present then so is the other

(3) both are included in stereoisomerism (4) they have no similarity

Q106. Which of the following does not show geometrical isomerism?

(1) 1, 2-dichloro - 1- pentene (2) 1, 3 - dichloro - 2- pentene

(3) 1, 1- dichloro - 1- pentene (4) 1, 4 - dichloro - 2- pentene

Q107. Which of the following compounds has wrong IUPAC name ?

(1) $CH_3-CH_2-CH_2-COO-CH_2CH_3 \longrightarrow$ ethyl butanoate

(2) $CH_3-\underset{\underset{CH}{|}}{CH}-CH_2-CHO \longrightarrow$ 3-methyl–butanal

(3) $CH_3-\underset{\underset{OH}{|}}{CH}-\underset{\underset{CH_3}{|}}{CH}-CH_3 \longrightarrow$ 2 - methyl–3–butanol

(4) $CH_3-\underset{\underset{CH_3}{|}}{CH}-\overset{\overset{O}{\|}}{C}-CH_2-CH_3 \longrightarrow$ 2–methyl–3–pentanone

Q108. Which of these will not react with acetylene ?

(1) NaOH (2) ammonical $AgNO_3$

(3) Na (4) HCl

Q109. In which of the following species is the underlined carbon having sp^3 hybridisation?

(1) $CH_3\underline{C}OOH$ (2) $CH_3\underline{C}H_2OH$

(3) $CH_3\underline{C}OCH_3$ (4) $CH_2 = \underline{C}H - CH_3$

Q110. Racemic mixture is formed by mixing two

(1) isomeric compounds (2) chiral compounds
(3) meso compounds (4) optical isomers

Q111. Na and Mg crystallize in BCC and FCC type crystals respectively, then the number of atoms of Na and Mg present in the unit cell of their respective crystal is
(1) 4 and 2 (2) 9 and 14
(3) 14 and 9 (4) 2 and 4

Q112. Freezing point of an aqueous solution is $(-0.186)^{\circ}\mathrm{C}$. Elevation of boiling point of the same solution is $\mathrm{K_b} = 0.512^{\circ}\mathrm{C}, \mathrm{K_f} = 1.86^{\circ}\mathrm{C}$, find the increase in boiling point.
(1) $0.186^{\circ}\mathrm{C}$ (2) $0.0512^{\circ}\mathrm{C}$
(3) $0.092^{\circ}\mathrm{C}$ (4) $0.2372^{\circ}\mathrm{C}$

Q113. With increase of temperature, which of these changes?
(1) molality (2) weight fraction of solute
(3) fraction of solute present in water (4) mole fraction

Q114. In mixture A and B component show -ve deviation as
(1) $\Delta V_{\text{mix}} > 0$ (2) $\Delta \mathrm{H}_{\text{mix}} < 0$
(3) A - B interaction is weaker than A - A and B - B interaction (4) A - B interaction is stronger than A - A and B - B interaction

Q115. Conductivity (unit Siemen's S) is directly proportional to area of the vessel and the concentration of the solution in it and is inversely proportional to the length of the vessel then the unit of the constant of proportionality is
(1) $\mathrm{Sm\ mol^{-1}}$ (2) $\mathrm{Sm^2\ mol^{-1}}$
(3) $\mathrm{S^{-2}\ m^2\ mol}$ (4) $\mathrm{S^2\ m^2\ mol^{-2}}$

Q116. EMF of a cell in terms of reduction potential of its left and right electrodes is
(1) $E = E_{\text{left}} - E_{\text{right}}$ (2) $E = E_{\text{left}} + E_{\text{right}}$
(3) $E = E_{\text{right}} - E_{\text{left}}$ (4) $E = -(E_{\text{right}} + E_{\text{left}})$

Q117. If ϕ denotes reduction potential, then which is true ?
(1) $E^0_{\text{cell}} = \phi_{\text{right}} - \phi_{\text{left}}$ (2) $\mathrm{E^0_{cell}} = \phi_{\text{left}} + \phi_{\text{right}}$
(3) $\mathrm{E^0_{cell}} = \phi_{\text{left}} - \phi_{\text{right}}$ (4) $\mathrm{E^0_{cell}} = -(\phi_{\text{left}} + \phi_{\text{right}})$

Q118. What will be the emf for the given cell $Pt\,|\mathrm{H_2\,(P_1)}|\mathrm{H^+(aq)}||\mathrm{H_2\,(P_2)}\,|\,\mathrm{Pt}$
(1) $\frac{RT}{f}\log\frac{P_1}{P_2}$ (2) $\frac{RT}{2f}\log\frac{P_1}{P_2}$
(3) $\frac{RT}{f}\log\frac{P_2}{P_1}$ (4) none of these

Q119. Which of the following reaction is possible at anode?
(1) $2\mathrm{Cr^{3+}} + 7\mathrm{H_2O} \rightarrow \mathrm{Cr_2O_7^{2-}} + 14\mathrm{H^+}$ (2) $\mathrm{F_2} \rightarrow 2\,\mathrm{F^-}$
(3) $(1/2)\mathrm{O_2} + 2\mathrm{H^+} \rightarrow \mathrm{H_2O}$ (4) none of these

Q120. When the sample of copper with zinc impurity is to be purified by electrolysis, the appropriate electrodes are
(1) cathode - pure zinc anode - pure copper (2) cathode - impure sample anode - pure copper
(3) cathode - impure zinc anode - impure sample (4) cathode - pure copper anode - impure sample

Q121. Units of rate constant of first and zero order reactions in terms of molarity M unit are respectively

(1) $\sec^{-1}, \text{Msec}^{-1}$ (2) $\sec^{-1}, \text{M}$

(3) $\text{Msec}^{-1}, \sec^{-1}$ (4) $\text{M}, \sec^{-1}$

Q122. For the reaction $A + 2B \rightarrow C$, rate is given by $R = [A][B]^2$ then the order of the reaction is

(1) 3 (2) 6

(3) 5 (4) 7

Q123. The differential rate law for the reaction $\text{H}_2 + \text{I}_2 \rightarrow 2\text{HI}$ is

(1) $-\frac{\text{d}[\text{H}_2]}{\text{dt}} = -\frac{\text{d}[\text{I}_2]}{\text{dt}} = -\frac{\text{d}[\text{HI}]}{\text{dt}}$ (2) $\frac{\text{d}[\text{H}_2]}{\text{dt}} = \frac{\text{d}[\text{I}_2]}{\text{dt}} = \frac{1}{2}\frac{1\,\text{d}[\text{HI}]}{\text{dt}}$

(3) $\frac{1}{2}\frac{\text{d}[\text{H}_2]}{\text{dt}} = \frac{1}{2}\frac{\text{d}[\text{I}_2]}{\text{dt}} = -\frac{\text{d}[\text{HI}]}{\text{dt}}$ (4) $-2\frac{\text{d}[\text{H}_2]}{\text{dt}} = -2\frac{\text{d}[\text{I}_2]}{\text{dt}} = \frac{\text{d}[\text{HI}]}{\text{dt}}$

Q124. If half-life of a substance is 5 yrs, then the total amount of substance left after 15 years, when initial amount is 64 grams is

(1) 16 grams (2) 2 grams

(3) 32 grams (4) 8 grams

Q125. The integrated rate equation is $Rt = \log C_0 - \log C_t$. The straight line graph is obtained by plotting

(1) time vs $\log C_t$ (2) $\frac{1}{\text{time}}$ vs C_t

(3) time vs C_t (4) $\frac{1}{\text{time}}$ vs $\frac{1}{C_t}$

Q126. The formation of gas at the surface of tungsten due to adsorption is the reaction of order

(1) 0 (2) 1

(3) 2 (4) insufficient data

Q127. Aluminium is extracted by the electrolysis of

(1) bauxite (2) alumina

(3) alumina mixed with molten cryolite (4) molten cryolite

Q128. The metal extracted by leaching with a cyanide is

(1) Mg (2) Ag

(3) Cu (4) Na

Q129. Cyanide process is used for the extraction of

(1) barium (2) aluminium

(3) boron (4) silver

Q130. When $\text{H}_2\,\text{S}$ is passed through $\text{Hg}_2\,\text{S}$ we get

(1) HgS (2) $\text{HgS} + \text{Hg}_2\,\text{S}$

(3) $\text{Hg}_2\,\text{S}$ (4) $\text{Hg}_2\,\text{S}_2$

Q131. In $\text{XeF}_2, \text{XeF}_4, \text{XeF}_6$ the numebr of lone pairs of Xe are respectively

(1) 2, 3, 1 (2) 1, 2, 3

(3) 4, 1, 2 (4) 3, 2, 1

Q132. In case of nitrogen, NCl_3 is possible but not NCl_5 while in case of phosphorous, PCl_3 as well as PCl_5 are possible. It is due to

(1) availability of vacant d orbitals in P but not in N (2) lower electronegativity of P than N
(3) lower tendency of H - bond formation in P than N (4) occurrence of P in solid while N in gaseous state at room temperature

Q133. Number of sigma bonds in P_4O_{10} is
(1) 6 (2) 7
(3) 17 (4) 16

Q134. Most common oxidation states of Ce (cerium) are
(1) +2, +3 (2) +2, +4
(3) +3, +4 (4) +3, +5

Q135. Arrange $Ce^{+3}, La^{+3}, Pm^{+3}$ and Yb^{+3} in increasing order of their ionic radii
(1) $Yb^{+3} < Pm^{+3} < Ce^{+3} < La^{+3}$ (2) $Ce^{+3} < Yb^{+3} < Pm^{+3} < La^{+3}$
(3) $Yb^{+3} < Pm^{+3} < La^{+3} < Ce^{+3}$ (4) $Pm^{+3} < La^{+3} < Ce^{+3} < Yb^{+3}$

Q136. Which of the following ions has the maximum magnetic moment ?
(1) Mn^{+2} (2) Fe^{+2}
(3) Ti^{+2} (4) Cr^{+2}

Q137. Which is the correct order of ionic sizes ? (Atomic Number : Ce = 58, Sn = 50, Yb = 70 and Lu = 71)
(1) Ce > Sn > Yb > Lu (2) Sn > Ce > Lu > Yb
(3) Lu > Yb > Sn > Ce (4) Sn > Yb > Ce > Lu

Q138. When $KMnO_4$ acts as an oxidising agent and ultimately forms $[MnO_4]^{-1}, MnO_2, Mn_2O_3, Mn^{+2}$ then the number of electrons transferred in each case respectively is
(1) 4, 3, 1, 5 (2) 1, 5, 3, 7
(3) 1, 3, 4, 5 (4) 3, 5, 7, 1

Q139. A square planar complex is formed by hybridisation of which atomic orbitals ?
(1) s, p_x, p_y, d_{yz} (2) $\mathbf{s}, \mathbf{p}_x, \mathbf{p}_y, \mathrm{d}_{x^2-y^2}$
(3) s, p_x, p_y, d_{z^2} (4) $\mathbf{s}, \mathbf{p}_y, \mathrm{p}_z, \mathrm{d}_{\mathrm{xy}}$

Q140. The type of isomerism present in nitropentamine chromium (III) chloride is
(1) optical (2) linkage
(3) ionization (4) polymerisation

Q141. The most stable ion is
(1) $[Fe(OH)_3]^{3-}$ (2) $[Fe(Cl)_6]^{3-}$
(3) $[Fe(CN)_6]^{3-}$ (4) $[Fe(H_2O)_6]^{3+}$

Q142. $CH_3 - Mg - Br$ is an organo metallic compound due to
(1) Mg – Br bond (2) *C* - *Mg* bond
(3) *C* - *Br* bond (4) C – H bond

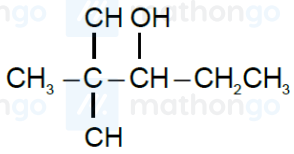
Q143. What is the product when acetylene reacts with hypochlorous acid ?
(1) CH_3COCl (2) $ClCH_2CHO$
(3) Cl_2CHCHO (4) ClCHCOOH

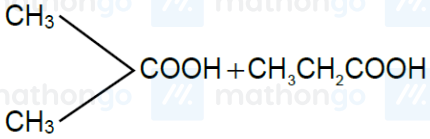
Q144. The reaction: $(CH_3)_3C-Br \xrightarrow{H_2O} (CH_3)_3-C-OH$

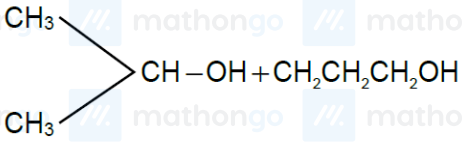
(1) elimination reaction
(2) substitution reaction
(3) free radical reaction
(4) displacement reaction

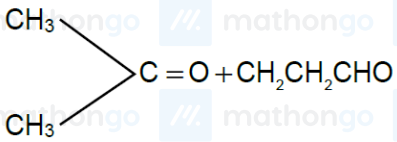
Q145. On vigorous oxidation by permanganate solution

$(CH_3)_2C=CH-CH_2-CHO$ gives

(1) 

(2) 

(3) 

(4) 

Q146. $CH_3CH_2COOH \xrightarrow[\text{red P}]{Cl_2} A \xrightarrow{\text{alc. KOH}} B$. What is B ?

(1) CH_3CH_2COCl
(2) CH_3CH_2CHO
(3) $CH_2=CHCOOH$
(4) $ClCH_2CH_2COOH$

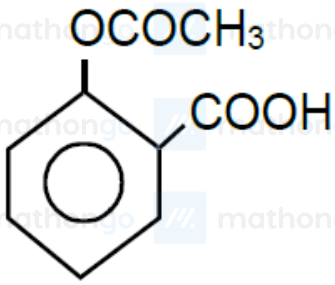
Q147. When primary amine reacts with chloroform in ethanoic KOH then the product is

(1) an isocyanide
(2) an aldehyde
(3) a cyanide
(4) an alcohol

Q148. Polymer formation from monomers starts by

(1) condensation reaction between monomers
(2) coordinate reaction between monomers
(3) conversion of monomer to monomer ions by protons
(4) hydrolysis of monomers

Q149.



The compound is used as

(1) antiseptic
(2) antibiotic
(3) analgesic
(4) pesticide

Q150. RNA is different from DNA because RNA contains

(1) ribose sugar and thymine
(2) ribose sugar and uracil
(3) deoxyribose sugar and thymine
(4) deoxyribose sugar and uracil

Q151. The functional group, which is found in amino acid is

(1) COOH group (2) NH_2 group

(3) CH_3 group (4) both (a) and (b)

Q152. If a, b, c are distinct $+ve$ real numbers and $a^2 + b^2 + c^2 = 1$ then $ab + bc + ca$ is

(1) less than 1 (2) equal to 1

(3) greater than 1 (4) any real no.

Q153. If $\alpha \neq \beta$ but $\alpha^2 = 5\alpha - 3$ and $\beta^2 = 5\beta - 3$ then the equation having α/β and β/α as its roots is

(1) $3x^2 - 19x + 3 = 0$ (2) $3x^2 + 19x - 3 = 0$

(3) $3x^2 - 19x - 3 = 0$ (4) $x^2 - 5x + 3 = 0$

Q154. Difference between the corresponding roots of $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ is same and $a \neq b$, then

(1) a + b + 4 = 0 (2) a + b - 4 = 0

(3) a - b - 4 = 0 (4) a - b + 4 = 0

Q155. Product of real roots of the equation $t^2x^2 + |x| + 9 = 0$

(1) is always positive (2) is always negative

(3) does not exist (4) none of these

Q156. If p and q are the roots of the equation $x^2 + px + q = 0$, then

(1) p =1, q = -2 (2) p = 0, q = 1

(3) p = -2, q = 0 (4) p = -2, q = 1

Q157. If $2a + 3b + 6c = 0 (a, b, c \in R)$ then the quadratic equation $ax^2 + bx + c = 0$ has

(1) at least one root in [0, 1] (2) at least one root in [2, 3]

(3) at least one root in [4, 5] (4) none of these

Q158. z and w are two non zero complex no.s such that $|z| = |w|$ and $\text{Arg}\, z + \text{Arg}\, w = \pi$ then z equals

(1) $\overline{W}$ (2) -$\overline{W}$

(3) W (4) -W

Q159. If $|z - 4| < |z - 2|$, its solution is given by

(1) Re(z) > 0 (2) Re(z) < 0

(3) Re (z) > 3 (4) Re(z) > 2

Q160. The locus of the centre of a circle which touches the circle $|z - z_1| = a$ and $|z - z_2| = b$ externally (z, z_1 and z_2 are complex numbers) will be

(1) an ellipse (2) a hyperbola

(3) a circle (4) none of these

Q161. Total number of four digit odd numbers that can be formed using 0, 1, 2, 3, 5, 7 (using repetition allowed) are

(1) 216 (2) 375

(3) 400 (4) 720

Q162. Number greater than 1000 but less than 4000 is formed using the digits 0, 1, 2, 3, 4 (repetition allowed) is

(1) 125
(2) 105
(3) 375
(4) 625

Q163. Five digit number divisible by 3 is formed using 0, 1, 2, 3, 4, 6 and 7 without repetition. Total number of such numbers are
(1) 312
(2) 3125
(3) 120
(4) 216

Q164. If $1, \log_9\left(3^{1-x}+2\right), \log_3\left(4.3^x-1\right)$ are in A.P. then x equals
(1) $\log_3 4$
(2) $1 + \log_3 4$
(3) $1 - \log_3 4$
(4) $\log_4 3$

Q165. The value of $2^{1/4}, 4^{1/8}, 8^{1/6} + \ldots\ldots\infty$ is
(1) 1
(2) 2
(3) 3/2
(4) 4

Q166. Fifth term of a GP is 2, then the product of its 9 terms is
(1) 256
(2) 512
(3) 1024
(4) none of these

Q167. Sum of infinite number of terms of GP is 20 and sum of their square is 100. The common ratio of GP is
(1) 5
(2) 3/5
(3) 8/5
(4) 1/5

Q168. $1^3 - 2^3 + 3^3 - 4^3 + \ldots . + 9^3 =$
(1) 425
(2) -425
(3) 475
(4) -475

Q169. The sum of integers from 1 to 100 that are divisible by 2 or 5 is
(1) 3000
(2) 3050
(3) 3600
(4) 3250

Q170. If $a_n = \sqrt{7+\sqrt{7+\sqrt{7+\ldots .}}}$ having n radical signs then by methods of mathematical induciton which is true
(1) $a_n > 7 \forall n \geq 1$
(2) $a_n > 7 \forall n \geq 1$
(3) $a_n < 4 \forall n \geq 1$
(4) $a_n < 3 \forall n \geq 1$

Q171. The coefficients of x^p and x^q in the expansion of $(1+x)^{p+q}$ are
(1) equal
(2) equal with opposite signs
(3) reciprocals of each other
(4) none of these

Q172. If the sum of the coefficients in the expansion of $(a+b)^n$ is 4096 , then the greatest coefficient in the expansion is
(1) 1594
(2) 792
(3) 924
(4) 2924

Q173. The positive integer just greater than $(1+0.0001)^{10000}$ is

(1) 4 (2) 5
(3) 2 (4) 3

Q174. r and n are positive integers $r > 1, n > 2$ and coefficient of $(r+2)^{\text{th}}$ term and $3r^{\text{th}}$ term in the expansion of $(1+x)^{2n}$ are equal, then n equals
(1) 3r (2) 3r + 1
(3) 2r (4) 2r + 1

Q175. The period of $\sin^2\theta$ is
(1) π^2 (2) π
(3) 2π (4) $\pi/2$

Q176. The number of solution of $\tan x + \sec x = 2\cos x$ in $[0, 2\pi)$ is
(1) 2 (2) 3
(3) 0 (4) 1

Q177. A triangle with vertices (4, 0), (-1, -1), (3, 5) is
(1) isosceles and right angled (2) isosceles but not right angled
(3) right angled but not isosceles (4) neither right angled nor isoceles

Q178. The sides of a triangle are 3x + 4y, 4x+37 and 5x + 57 where x, y > 0 then the triangle is
(1) right angled (2) obtuse angled
(3) equilateral (4) none of these

Q179. If the pair of lines $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ intersect on the y - axis then
(1) $2fgh = bg^2 + ch^2$ (2) $bg^2 \neq ch^2$
(3) $abc = 2fgh$ (4) none of these

Q180. The point of lines represented by $3ax^2 + 5xy + (a^2 - 2)y^2 = 0$ and perpendicular to each other for
(1) two values of a (2) $\forall a$
(3) for one value of a (4) for no values of a

Q181. Locus of mid point of the portion between the axes of $x\cos\alpha + y\sin\alpha = p$ where p is constant is
(1) $x^2 + y^2 = \frac{4}{p^2}$ (2) $x^2 + y^2 = 4p^2$
(3) $\frac{1}{x^2} + \frac{1}{y^2} = \frac{2}{p^2}$ (4) $\frac{1}{x^2} + \frac{1}{y^2} = \frac{4}{p^2}$

Q182. If the chord $y = mx + 1$ of the circle $x^2 + y^2 = 1$ subtends an angle of measure 45^0 at the major segment of the circle then value of m is
(1) $2 \pm \sqrt{2}$ (2) $-2 \pm \sqrt{2}$
(3) $-1 \pm \sqrt{2}$ (4) none of these

Q183. The centres of a set of circles, each of radius 3 , lie on the circle $x^2 + y^2 = 25$. The locus of any point in the set is
(1) $4 \leq x^2 + y^2 \leq 64$ (2) $x^2 + y^2 \leq 25$
(3) $x^2 + y^2 \geq 25$ (4) $3 \leq x^2 + y^2 \leq 9$

Q184. The centre of the circle passing through $(0, 0)$ and $(1, 0)$ and touching the circle $x^2 + y^2 = 9$ is

(1) $\left(\frac{1}{2}, \frac{1}{2}\right)$ (2) $\left(\frac{1}{2}, -\sqrt{2}\right)$
(3) $\left(\frac{3}{2}, \frac{1}{2}\right)$ (4) $\left(\frac{1}{2}, \frac{3}{2}\right)$

Q185. Two common tangents to the circle $x^2 + y^2 = 2a^2$ and parabola $y^2 = 8ax$ are
(1) $x = \pm(y + 2a)$ (2) $y = \pm(x + 2a)$
(3) $x = \pm(y + a)$ (4) $y = \pm(x + a)$

Q186. $\lim_{x\to 0} \frac{\sqrt{1-\cos 2x}}{\sqrt{2}x}$ is
(1) 1 (2) -1
(3) zero (4) does not exist

Q187. $\lim_{x\to\infty} \left(\frac{x^2+5x+3}{x^2+x+3}\right)^{\frac{1}{x}}$
(1) e^4 (2) e^2
(3) e^3 (4) 1

Q188. Let $f(x) = 4$ and $f'(x) = 4$. Then $\lim_{x\to 2} \frac{xf(2)-2f(x)}{x-2}$ is given by
(1) 2 (2) -2
(3) -4 (4) 3

Q189. $\lim_{n\to\infty} \frac{1^p + 2^p + 3^p + \ldots + n^p}{n^{p+1}}$
is
(1) $\frac{1}{p+1}$ (2) $\frac{1}{1-p}$
(3) $\frac{1}{p} - \frac{1}{p-1}$ (4) $\frac{1}{p+2}$

Q190. $\lim_{x\to 0} \frac{\log x^n - [x]}{[x]}$, n $\in$ N([x] denotes greatest integer less than or equal to x)
(1) has value -1 (2) has value 0
(3) has value 1 (4) does not exist

Q191. If $f(1) = 1, f'(1) = 2$, then $\lim_{x\to 1} \frac{\sqrt{f(x)}-1}{\sqrt{x}-1}$ is
(1) 2 (2) 4
(3) 1 (4) 1/2

Q192. In a class of 100 students there are 70 boys whose average marks in a subject are 75. If the average marks of the complete class is 72, then what is the average of the girls?
(1) 73 (2) 65
(3) 68 (4) 74

Q193. The equation of a circle with origin as a centre and passing through equilateral triangle whose median is of length 3a is

(1) $x^2+y^2=9a^2$ (2) $x^2+y^2=16a^2$
(3) $x^2+y^2=4a^2$ (4) $x^2+y^2=a^2$

Q194. In a triangle with sides $a, b, c, r_1 > r_2 > r_3$ (which are the ex-radii) then
(1) a > b > c (2) a < b < c
(3) a > b and b < c (4) a < b and b > c

Q195. l, m, n are the p^{th}, q^{th} and r^{th} term of a G.P. all positive, then $\begin{vmatrix} \log l & p & 1 \\ \log m & q & 1 \\ \log n & r & 1 \end{vmatrix}$ equals
(1) -1 (2) 2
(3) 1 (4) 0

Q196. If $a > 0$ discriminant of $ax^2+2bx+c$ is -ve, then $\begin{vmatrix} a & b & ax+b \\ b & c & bx+c \\ ax+b & bx+c & 0 \end{vmatrix}$ is
(1) +ve (2) $\left(ac-b^2\right)\left(ax^2+2bx+c\right)$
(3) -ve (4) 0

Q197. $\cot^{-1}(\sqrt{\cos\alpha}) = \tan^{-1}(\sqrt{\cos\alpha}) = x$, then $\sin x =$
(1) $\tan^2\left(\frac{\alpha}{2}\right)$ (2) $\cot^2\left(\frac{\alpha}{2}\right)$
(3) $\tan\alpha$ (4) $\cot\left(\frac{\alpha}{2}\right)$

Q198. The domain of $\sin^{-1}\left[\log_3(x/3)\right]$ is
(1) [1, 9] (2) [-1,9]
(3) [-9, 1] (4) [-9, -1]

Q199. Which one is not periodic
(1) $|\sin 3x| + \sin^2 x$ (2) $\cos\sqrt{x} + \cos^2 x$
(3) $\cos 4x + \tan^2 x$ (4) $\cos 2x + \sin x$

Q200. If $f(x+y) = f(x)\cdot f(y) \forall x \cdot y$ and $f(5)=2, f'(0)=3$ then $f'(5)$ is
(1) 0 (2) 1
(3) 6 (4) 2

Q201. f is defined in [-5, 5] as f(x) = x if x is rational and = -x is irrational. Then
(1) f(x) is continuous at every x, except x = 0 (2) f(x) is discontinuous at every x, except x = 0
(3) f(x) is continuous everywhere (4) f(x) is discontinuous everywhere

Q202. If $y = \left(x+\sqrt{1+x^2}\right)^n$, then $\left(1+x^2\right)\frac{d^2y}{dx^2} + x\frac{dy}{dx}$ is
(1) n^2y (2) $-n^2y$
(3) $-y$ (4) $2x^2y$

Q203. The maximum distance from origin of a point on the curve $x = a\sin t - b\sin\left(\frac{at}{b}\right)$ $y = a\cos t - b\cos\left(\frac{at}{b}\right)$, both $a, b > 0$ is
(1) a - b (2) a + b
(3) $\sqrt{a^2+b^2}$ (4) $\sqrt{a^2-b^2}$

Q204. $\int_0^{10\pi} |\sin x| dx$ is

(1) 20 (2) 8

(3) 10 (4) 18

Q205. $I_n = \int_0^{\pi/4} \tan^n x dx$ then $\text{Lim}_{n\to\infty}\, n\,[I_n + I_{n-2}]$ equals

(1) 1/2 (2) 1

(3) ∞ (4) zero

Q206. $\int_0^{\sqrt{2}} [x^2] dx$ is

(1) $2-\sqrt{2}$ (2) $2+\sqrt{2}$

(3) $\sqrt{2}-1$ (4) $\sqrt{2}-2$

Q207. $\int_{-\pi}^{\pi} \frac{2x(1+\sin x)}{1+\cos^2 x} dx$ is

(1) $\frac{\pi^2}{4}$ (2) π^2

(3) zero (4) $\frac{\pi}{2}$

Q208. If $y = f(x)$ makes $+ve$ intercept of 2 and 0 unit on x and y axes and encloses an area of $3/4$ square unit with the axes then $\int_0^2 x f'(x) dx$ is

(1) 3/2 (2) 1

(3) 5/4 (4) -3/4

Q209. The area bounded by the curves $y = \ln x, y = \ln|x|, y = |\ln x|$ and $y = |\ln||x|$ is

(1) 4 sq. units (2) 6 sq. units

(3) 10 sq. units (4) none of these

Q210. The order and degree of the differential equation $\left(1 + 3\frac{dy}{dx}\right)^{2/3} = 4\frac{d^3y}{dx^3}$ are

(1) $\left(1, \frac{2}{3}\right)$ (2) (3, 1)

(3) (3, 3) (4) (1, 2)

Q211. The solution of the equation $\frac{d^2y}{dx^2} = e^{-2x}$

(1) $\frac{e^{-2x}}{4}$ (2) $\frac{e^{-2x}}{4} + cx + d$

(3) $\frac{1}{4}e^{-2x} + cx^2 + d$ (4) $\frac{1}{4}e^{-4x} + cx + d$

Q212. $f(x)$ and $g(x)$ are two differentiable functions on $[0, 2]$ such that $f''(x) - g''(x) = 0$
$f'(1) = 2g'(1) = 4f(2) = 3g(2) = 9$ then $f(x) - g(x)$ at $x = 3/2$ is

(1) 0 (2) 2

(3) 10 (4) 5

Q213. If $|\vec{a}| = 4, |\vec{b}| = 2$ and the angle between $\vec{a}$ and $\vec{b}$ is $\pi/6$ then $(\vec{a} \times \vec{b})^2 = 2$ is equal to

(1) 48 (2) 16

(3) $\vec{a}$ (4) none of these

Q214.

If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $|\vec{a}\vec{b}\vec{c}| = 4$ then $\left|\vec{a}\times\vec{b}\ \ \vec{b}\times\vec{c}\ \ \vec{c}\times\vec{a}\right| =$

(1) 16 (2) 64

(3) 4 (4) 8

Q215. If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{a}+\vec{b}+\vec{c}=0$ and $|\vec{a}|=7, |\vec{b}|=5, |\vec{c}|=3$ then angle between vector $\vec{b}$ and $\vec{c}$ is

(1) 60° (2) 30°

(3) 45° (4) 90°

Q216. If $|a|=5, |b|=4, |c|=3$ thus what will be the value of $|a\cdot b+b.c+c.a|$, given that $\vec{a}+\vec{b}+\vec{c}=0$

(1) 25 (2) 50

(3) -25 (4) -50

Q217. $3\lambda\vec{c}+2\mu(\vec{a}\times\vec{b})=0$ then

(1) $3\lambda+2\mu=0$ (2) $3\lambda=2\mu$

(3) $\lambda=\mu$ (4) $\lambda+\mu=0$

Q218. $\vec{a}=3\hat{i}-5\hat{j}$ and $\vec{b}=6\hat{i}+3\hat{j}$ are two vectors and $\vec{c}$ is a vector such that $\vec{c}=\vec{a}\times\vec{b}$ then

$$|\vec{a}| : |\vec{b}| : |\vec{c}|$$

(1) $\sqrt{34}:\sqrt{45}:\sqrt{39}$ (2) $\sqrt{34}:\sqrt{45}:39$

(3) $34:39:45$ (4) $39:35:34$

Q219. If $\vec{a}\times\vec{b}=\vec{b}\times\vec{c}=\vec{c}\times\vec{a}$ then $\vec{a}+\vec{b}+\vec{c}=$

(1) abc (2) -1

(3) 0 (4) 2

Q220. The sum of two forces is 18 N and resultant whose direction is at right angles to the smaller force is 12 N. The magnitude of the two forces are

(1) 13, 5 (2) 12, 6

(3) 14, 4 (4) 11, 7

Q221. A plane which passes through the point $(3,2,0)$ and the line $\frac{x-4}{1}=\frac{y-7}{5}=\frac{z-4}{4}$ is

(1) x - y + z = 1 (2) x + y + z = 5

(3) x + 2y - z = 1 (4) 2x - y + z = 5

Q222. The d.r. of normal to the plane through $(1,0,0),(0,1,0)$ which makes an angle $\pi/4$ with plane $x+y=3$ are

(1) $1,\sqrt{2},1$ (2) $1,1,\sqrt{2}$

(3) $1,1,2$ (4) $\sqrt{2},1,1$

Q223. A problem in mathematics is given to three students $\mathrm{A},\mathrm{B},\mathrm{C}$ and their respective probability of solving the problem is $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$. Probability that the problem is solved is

(1) $\frac{3}{4}$ (2) $\frac{1}{2}$

(3) $\frac{2}{3}$ (4) $\frac{1}{3}$

Q224. A and B are events such that $P(A\cup B)=3/4, P(A\cap B)=1/4, P(\bar{A})=2/3$ then $P(\bar{A}\cap B)$ is

(1) 5/12 (2) 3/8

(3) 5/8 (4) 1/4

Q225. A die is tossed 5 times. Getting an odd number is considered a success. Then the variance of distribution of success is

(1) 8/3
(2) 3/8
(3) 4/5
(4) 5/4