Q1. Two buses P and Q start from a point at the same time and move in a straight line and their positions are represented by $x_P t = \alpha t + \beta t^2$ and $x_Q t = ft - t^2$. At what time, both the buses have same velocity ?

(1) $\frac{\alpha - f}{1 + \beta}$ (2) $\frac{\alpha + f}{2\beta - 1}$

(3) $\frac{\alpha + f}{21 + \beta}$ (4) $\frac{f - \alpha}{21 + \beta}$

Q2. Given below are two statements. One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Two identical balls A and B thrown with same velocity 'u' at two different angles with horizontal attained the same range R. If A and B reached the maximum height h_1 and h_2 respectively, then $R = 4\sqrt{h_1 h_2}$

Reason R: Product of said heights. $h_1 h_2 = \frac{u^2 \sin^2\theta}{2g} \cdot \frac{u^2 \cos^2\theta}{2g}$

(1) Both A and R are true and R is the correct explanation of A.

(2) Both A and R are true but R is NOT the correct explanation of A.

(3) A is true but R is false.

(4) A is false but R is true.

Q3. A disc with a flat small bottom beaker placed on it at a distance R from its center is revolving about an axis passing through the center and perpendicular to its plane with an angular velocity ω. The coefficient of static friction between the bottom of the beaker and the surface of the disc is μ. The beaker will revolve with the disc if :

(1) $R \leq \frac{\mu g}{2\omega^2}$ (2) $R \leq \frac{\mu g}{\omega^2}$

(3) $R \geq \frac{\mu g}{2\omega^2}$ (4) $R \geq \frac{\mu g}{\omega^2}$

Q4. For a particle in uniform circular motion, the acceleration $\vec{a}$ at any point PR, θ on the circular path of radius R is (when θ is measured from the positive x-axis and v is uniform speed):

(1) $-\frac{v^2}{R}\sin\theta\hat{i} + \frac{v^2}{R}\cos\theta\hat{j}$ (2) $-\frac{v^2}{R}\cos\theta\hat{i} + \frac{v^2}{R}\sin\theta\hat{j}$

(3) $-\frac{v^2}{R}\cos\theta\hat{i} - \frac{v^2}{R}\sin\theta\hat{j}$ (4) $-\frac{v^2}{R}\hat{i} + \frac{v^2}{R}\hat{j}$

Q5. A solid metallic cube having total surface area $24 \ \ m^2$ is uniformly heated. If its temperature is increased by $10°C$, calculate the increase in volume of the cube. (Given $\alpha = 5.0 \times 10^{-4} °C^{-1}$).

(1) $2.4 \times 10^6 \ \ cm^3$ (2) $1.2 \times 10^5 \ \ cm^3$

(3) $6 \times 10^4 \ \ cm^3$ (4) $4.8 \times 10^5 \ \ cm^3$

Q6. A copper block of mass $5.0 \ \ kg$ is heated to a temperature of $500°C$ and is placed on a large ice block. What is the maximum amount of ice that can melt?

[Specific heat of copper : $0.39 Jg^{-1}°C^{-1}$ and latent heat of fusion of water : $335 \ \ Jg^{-1}$]

(1) $1.5 \ \ kg$ (2) $5.8 \ \ kg$

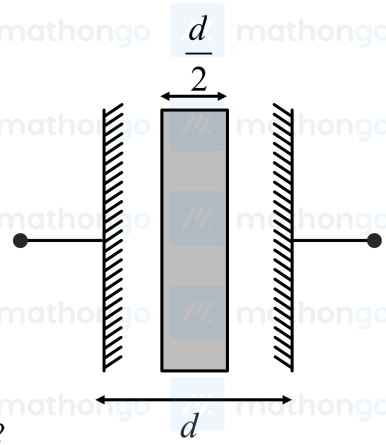
(3) $2.9 \ \ kg$ (4) $3.8 \ \ kg$

Q7. The ratio of specific heats $\frac{C_P}{C_V}$ in terms of degree of freedom f is given by :

(1) $1 + \frac{f}{3}$ (2) $1 + \frac{2}{f}$

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

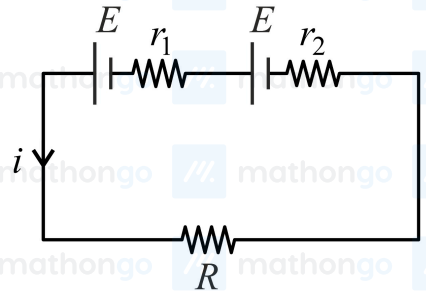
Q8. Two metallic plates form a parallel plate capacitor. The distance between the plate is 'd'. A metal sheet of thickness $\frac{d}{2}$ and of area equal to area of each plate is introduced between the plates. What will be the ratio of the



new capacitance to the original capacitance of the capacitor?

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

Q9. Two cells of the same EMF E but different internal resistances r_1 and r_2 are connected in series with an external resistance R as shown in the figure. The terminal potential difference across, the second cell is found to be zero. The external resistance R must then be:



(1) $r_1 r_2$
(2) r_1 - r_2
(3) r_2 - r_1
(4) $r_1 + r_2$

Q10. If n represents the actual number of deflections in a converted galvanometer of resistance G and shunt resistance S. Then the total current I when its figure of merit is K will be

(1) $\frac{KS}{S+G}$
(2) $\frac{G+S}{nKS}$
(3) $\frac{nKS}{G+S}$
(4) $\frac{nKG+S}{S}$

Q11. Given below are two statements :

Statement - I : Susceptibilities of paramagnetic and ferromagnetic substances increase with decrease in temperature.

Statement - II : Diamagnetism is a result of orbital motions of electrons developing magnetic moments opposite to the applied magnetic field.

Choose the correct answer from the options given below

(1) Both Statement - I and Statement - II are true.
(2) Both Statement - I and Statement - II are false.
(3) Statement - I is true but Statement - II is false.
(4) Statement- I is false but Statement - II is true.

Q12. A long solenoid carrying a current produces a magnetic field B along its axis. If the current is doubled and the number of turns per cm is halved, the new value of magnetic field will be equal to

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

Q13. A sinusoidal voltage $Vt = 210\sin 3000t$ volt is applied to a series LCR circuit in which $L = 10$ mH, $C = 25$ μF and $R = 100\Omega$. The phase difference Φ between the applied voltage and resultant current will be

(1) $\tan^{-1}0.17$ (2) $\tan^{-1}9.46$
(3) $\tan^{-1}0.30$ (4) $\tan^{-1}13.33$

Q14. The electromagnetic waves travel in a medium at a speed of 2.0×10^8 m s^{-1}. The relative permeability of the medium is 1.0. The relative permittivity of the medium will be

(1) 2.25 (2) 4.25
(3) 6.25 (4) 8.25

Q15. The interference pattern is obtained with two coherent light sources of intensity ratio 4: 1. And the ratio $\frac{I_{\max} + I_{\min}}{I_{\max} - I_{\min}}$ is $\frac{5}{x}$. Then, the value of x will be equal to :

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

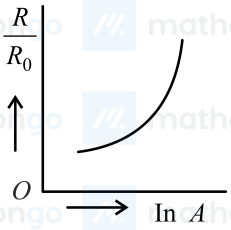
Q16. A light whose electric field vectors are completely removed by using a good polaroid, allowed to incident on the surface of the prism at Brewster's angle. Choose the most suitable option for the phenomenon related to the prism.

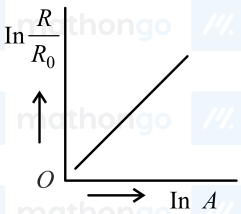
(1) Reflected and refracted rays will be perpendicular to each other. (2) Wave will propagate along the surface of prism.
(3) No refraction, and there will be total reflection of light. (4) No reflection. and there will be total transmission of light.

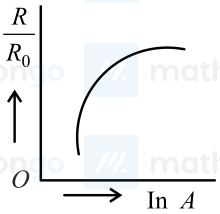
Q17. A proton, a neutron, an electron and an α-particle have same energy. If $\lambda_p, \lambda_n, \lambda_e$ and λ_α are the de Broglie's wavelengths of proton, neutron, electron and α particle respectively, then choose the correct relation from the following

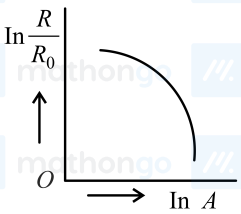
(1) $\lambda_p = \lambda_n > \lambda_e > \lambda_\alpha$ (2) $\lambda_a < \lambda_n < \lambda_p < \lambda_e$
(3) $\lambda_e < \lambda_p = \lambda_n > \lambda_\alpha$ (4) $\lambda_e = \lambda_p = \lambda_n = \lambda_\alpha$.

Q18. Which of the following figure represents the variation of $\ln\frac{R}{R_0}$ with $\ln A$ (if $R =$ radius of a nucleus and $A =$ its mass number)

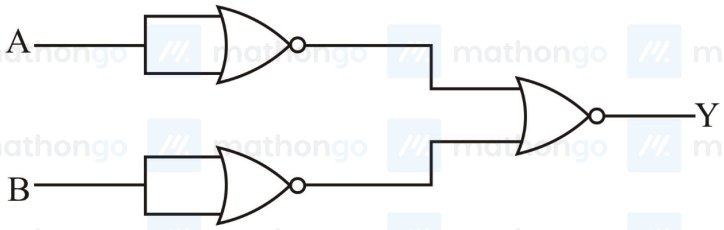
(1) 

(2) 

(3) 

(4) 

Q19. Identify the logic operation performed by the given circuit



(1) AND gate
(2) OR gate
(3) NOR gate
(4) NAND gate

Q20. Match List I with List II

	List I		**List II**
(A)	Facsimile	(I)	Static Document Image
(B)	Guided media Channel	(II)	Local Broadcast Radio
(C)	Frequency Modulation	(III)	Rectangular wave
(D)	Digital Signal	(IV)	Optical Fiber

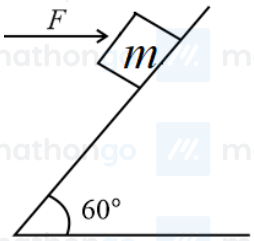
Choose the correct answer from the following options

(1) A - IV, B - III, C - II, D - I
(2) A - I, B - IV, C - II, D - III
(3) A - IV, B - II, C - III, D - I
(4) A - I, B - II, C - III, D - IV

Q21. For $z = a^2x^3y^{\frac{1}{2}}$, where '$a$' is a constant. If percentage error in measurement of 'x' and 'y' are 4%and 12%, respectively, then the percentage error for 'z' will be _____ %.

Q22. A curved in a level road has a radius 75 m. The maximum speed of a car turning this curved road can be 30 m s^{-1} without skidding. If radius of curved road is changed to 48 m and the coefficient of friction between the tyres and the road remains same, then maximum allowed speed would be _____ m s^{-1}.

Q23. A block of mass 200 g is kept stationary on a smooth inclined plane by applying a minimum horizontal force $F = \sqrt{x}$ N as shown in figure.



The value of $x =$ ____.

Q24. Moment of Inertia (M.I.) of four bodies having same mass M and radius $2R$ are as follows

$I_1 =$ M.I. of solid sphere about its diameter

$I_2 =$ M.I. of solid cylinder about its axis

$I_3 =$ M.I. of solid circular disc about its diameter

$I_4 =$ M.I. of thin circular ring about its diameter

If $2I_2 + I_3 + I_4 = xI_1$ then the value of x will be _____ .

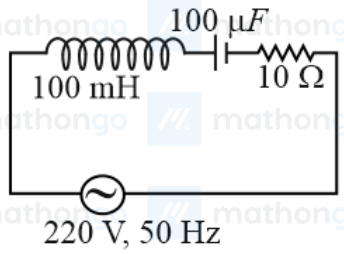
Q25. Two satellites S_1 and S_2 are revolving in circular orbits around a planet with radius $R_I = 3200$ km and $R_2 = 800$ km respectively. The ratio of speed of satellite S_1 to the speed of satellite S_2 in their respective orbits would be $\frac{1}{x}$ where $x =$

Q26. When a gas filled in a closed vessel is heated by raising the temperature by 1°C, its pressure increases by 0.4% The initial temperature of the gas is _____ K.

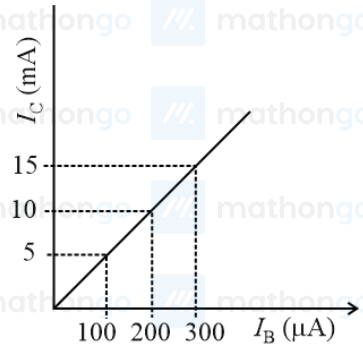
Q27. 27 identical drops are charged at 22 V each. They combine to form a bigger drop. The potential of the bigger drop will be _____ V.

Q28. The length of a given cylindrical wire is increased to double of its original length. The percentage increase in the resistance of the wire will be _____ %

Q29. In a series LCR circuit, the inductance, capacitance and resistance are $L = 100$ mH, $C = 100$ μFand $R = 10$ Ω respectively. They are connected to an AC source of voltage 220 V and frequency of 50 Hz. The approximate value of current in the circuit will be _____ A.



Q30. In an experiment of CE configuration of n - p - n transistor, the transfer characteristics are observed as given in figure.



If the input resistance is 200Ω and output resistance is 60Ω, the voltage gain in this experiment will be _____ .

Q31. The minimum energy that must be possessed by photons in order to produce the photoelectric effect with platinum metal is:
[Given: The threshold frequency of platinum is 1.3×10^{15} s^{-1} and $h = 6.6 \times 10^{-34}$Js]
(1) 8.58×10^{-19}J
(2) 9.76×10^{-20}J
(3) 3.21×10^{-14}J
(4) 6.24×10^{-16}J

Q32. What is the correct oder of electron gain enthalpy of Cl, F, Te, Po
(1) F > Cl > Te > Po
(2) Cl > F > Te > Po
(3) Te > Po > Cl > F
(4) Po > Te > F > Cl

Q33. At 25 °C and 1 atm pressure, the enthalpy of combustion of benzene 1 and acetylene g are -3268 kJ mol^{-1} and -1300 kJ mol^{-1}, respectively. The change in enthalpy for the reaction $3C_2H_2g \rightarrow C_6H_6l$, is
(1) +324 kJ mol^{-1}
(2) +632 kJ mol^{-1}
(3) -632 kJ mol^{-1}
(4) -732 kJ mol^{-1}

Q34. The K_{sp} for bismuth sulphide Bi_2S_3 is 1.08×10^{-73}. The solubility of Bi_2S_3 in $molL^{-1}$ at 298 K is
(1) 1.0×10^{-15}
(2) 2.7×10^{-12}
(3) 3.2×10^{-10}
(4) 4.2×10^{-8}

Q35. Assertion: The amphoteric behaviour of water is explained by Lewis acid base theory
Reason: water acts as acid with NH_3 and base with H_2S
(1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(2) Both Assertion and Reason are true but Reason is NOT the correct explanation of Assertion.
(3) Assertion is true but Reason is false.
(4) Assertion is false but Reason is true.

Q36. The number of bridged oxygen atoms present in compound B formed from the following reactions is

$$PbNO_{3_2} \xrightarrow{673\ K} A + PbO + O_2$$

$$A \xrightarrow[\text{Dimerise}]{} B$$

(1) 0
(2) 1
(3) 2
(4) 3

Q37. Given below are two statements: one is labelled as Assertion and the other is labelled as Reason.

Assertion: A mixture contains benzoic acid and napthalene. The pure benzoic acid can be separated out by the use of benzene.

Reason: Benzoic acid is soluble in hot water.

In the light of the above statements, choose the most appropriate answer from the options given below.

(1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(2) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(3) Assertion is true but Reason is false.

(4) Assertion is false but Reason is true.

Q38. Given below are two statements: one is labelled as Assertion and the other is labelled as Reason.

Assertion: Polluted water may have a value of BOD of the order of 17ppm.

Reason: BOD is a measure of oxygen required to oxidise both the biodegradable and non-biodegradable organic material in water.

In the light of the above statements, choose the *most appropriate* answer from the options given below.

(1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(2) Both Assertion and Reason are true but Reason is NOT the correct explanation of Assertion.

(3) Assertion is true but Reason is false.

(4) Assertion is false but Reason is true.

Q39. Solute A associates in water. When 0.7 g of solute A is dissolved in 42.0 g of water, it depresses the freezing point by 0.2 °C. The percentage association of solute A in water, is

[Given: Molar mass of A $= 93$ g mol^{-1}. Molal depression constant of water is 1.86 K kg mol^{-1}]

(1) 50%

(2) 60%

(3) 70%

(4) 80%

Q40. The correct order of reduction potentials of the following pairs is

A. Cl_2 / Cl^-

B. I_2 / I^-

C. Ag^+ / Ag

D. Na^+ / Na

E. Li^+ / Li

Choose the correct answer from the options given below.

(1) A > B > C > E > D

(2) A > C > B > E > D

(3) A > B > C > D > E

(4) A > C > B > D > E

Q41. Given below are two statements.

Statement I: During electrolytic refining. blister copper deposits precious metals.

Statement II: In the process of obtaining pure copper by electrolysis method, copper blister is used to make the anode.

In the light of the above statements, choose the correct answer from the options given below.

(1) Both Statement I and Statement II are true.

(2) Both Statement I and Statement II are false.

(3) Statement I is true but Statement II is false.

(4) Statement I is false but Statement II is true.

Q42. The metal ion (in gaseous state) with lowest spin-only magnetic moment value is

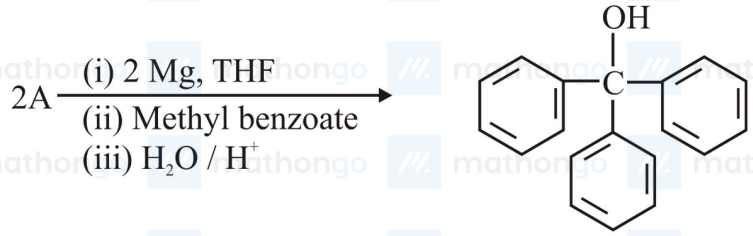
(1) V^{2+}

(2) Ni^{2+}

(3) Cr^{2+}

(4) Fe^{2+}

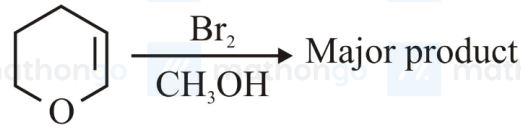
Q43. In the given reaction

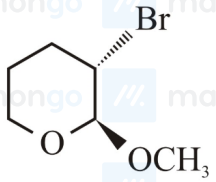


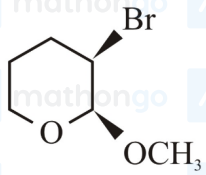
'A' can be

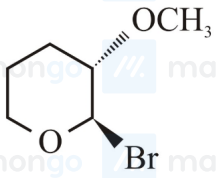
(1) benzyl bromide
(2) bromobenzene
(3) cyclohexyl bromide
(4) methyl bromide

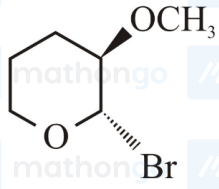
Q44. Amongst the following, the major product of the given chemical reaction is



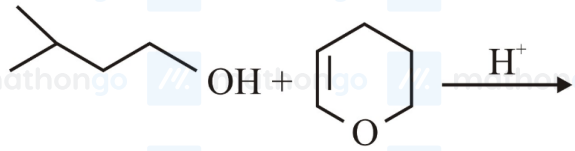
(1)


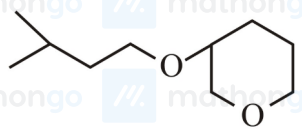
(2)


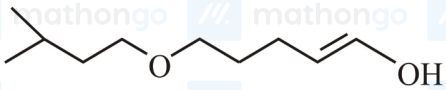
(3)


(4)


Q45. The major product formed in the following reaction, is



(1)


(2)


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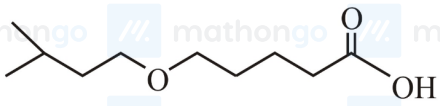

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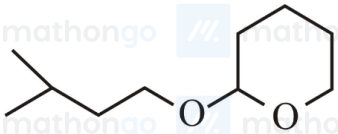
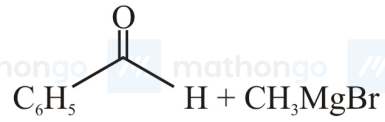
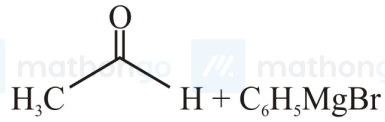


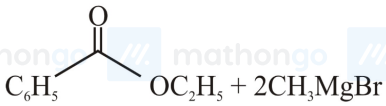
Q46. Which of the following conditions or reaction sequence will NOT give acetophenone as the major product?

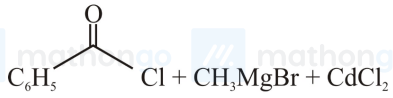
(1) (a) 

(b) $Na_2Cr_2O_7, H^+$

(2) (a) 

(b) PCC, DCM

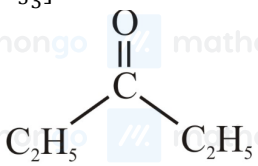
(3) 

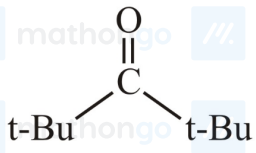
(4) 

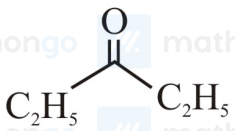
Q47. During halogen test, sodium fusion extract is boiled with concentrated HNO_3 to

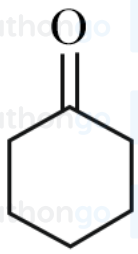
(1) remove unreacted sodium
(2) decompose cyanide or sulphide of sodium
(3) extract halogen from organic compound
(4) maintain the pH of extract.

Q48. Which of the following ketone will NOT give enamine on treatment with secondary amines? [where t - Bu is $-CCH_{33}$]

(1) 

(2) 

(3) 

(4) 

Q49. Match the following correctly

(i) Zymase	(a) Stomach
(ii) Urease	(b) Yeast
(iii) Diastase	(c) Malt
(iv) Pepsin	(d)Soyabean

(1) (i)-B; (ii) D(iii)-C; (iv)-A
(2) (i)-B; (ii)-A; (iii)-C; (iv)-D
(3) (i)-A; (ii)-B; (iii)-C; (iv)-D
(4) (i)-D; (ii)-C; (iii)-B; (iv)-A

Q50. An antiseptic dettol is a mixture of two compounds 'A' and 'B' where A has 6π electrons and B has 2π electrons. What is B?

(1) Bithional
(2) Terpineol
(3) Chlorophenol
(4) Chloroxyenol

Q51. A protein 'A' contains 0.30% of glycine (molecular weight 75). The minimum molar mass of the protein 'A' is____ $\times 10^3$ g mol^{-1} [nearest integer]

Q52. How many of the following molecules are with non-zero net dipole moment,
NH_3 , HCl, H_2O , BeF_2, BH_3, CCl_4

Q53. A rigid nitrogen tank stored inside a laboratory has a pressure of 30 atm at 06: 00 am when the temperature is 27 °C. At 03: 00pm, when the temperature is 45 °C, the pressure in the tank will be _____ atm. [nearest integer]

Q54. The neutralization occurs when 10 mL of 0.1 M acid 'A' is allowed to react with 30 mL of 0.05 M base MOH_2. The basicity of the acid 'A' is
[M is a metal]

Q55. A solution of Fe_2SO_{43} is electrolyzed for 'x' min with a current of 1.5 A to deposit 0.3482 g of Fe. The value of x is - [nearest integer]
Given : 1 F = 96500 $Cmol^{-1}$. Atomic mass of Fe = 56 $gmol^{-1}$

Q56. At 345 K, the half life for the decomposition of a sample of a gaseous compound initially at 55.5 kPa was 340 s. When the pressure was 27.8 kPa, the half life was found to be 170 s. The order of the reaction is - [integer answer]

Q57. $PCl_5 + H_2O \rightarrow A + HCl$
$A + H_2O \rightarrow B + HCl$
Find number of ionisable hydrogen in B

Q58. Amongst $FeCl_3 . 3H_2O$, K_3FeCN_6 and $CoNH_{36}Cl_3$, the spin-only magnetic moment value of the inner-orbital complex that absorbs light at shortest wavelength is B.M. [nearest integer]

Q59. The Novolac polymer has mass of 963 g. The number of monomer units present in it are

Q60. How many of the given compounds will give a positive Biuret test____?
Glycine, Glycylalanine, Tripeptide, Biuret

Q61. Let $A = x \in R: x + 1 < 2$ and $B = x \in R: x - 1 \geq 2$. Then which one the following statements is NOT true?
(1) $A - B = -1, 1$ (2) $B - A = R - -3, 1$
(3) $A \cap B = (-3, -1]$ (4) $A \cup B = R - [1, 3)$

Q62. Let $a, b \in R$ be such that the equation $ax^2 - 2bx + 15 = 0$ has repeated root α and if α and β are the roots of the equation $x^2 - 2bx + 21 = 0$, then $\alpha^2 + \beta^2$ is equal to:
(1) 37 (2) 58
(3) 68 (4) 92

Q63. Let z_1 and z_2 be two complex numbers such that $\bar{z}_1 = i\bar{z}_2$ and $\arg\frac{z_1}{\bar{z}_2} = \pi$, then the argument of z_1 is
(1) arg $z_2 = \frac{\pi}{4}$ (2) arg $z_2 = -\frac{3\pi}{4}$
(3) arg $z_1 = \frac{\pi}{4}$ (4) arg $z_1 = -\frac{3\pi}{4}$

Q64. The sum $1 + 2 \cdot 3 + 3 \cdot 3^2 + \ldots \ldots \ldots + 10 \cdot 3^9$ is equal to

(1) $\frac{2 \cdot 3^{12}+10}{4}$ (2) $\frac{19 \cdot 3^{10}+1}{4}$
(3) $5 \cdot 3^{10}$ - 2 (4) $\frac{9 \cdot 3^{10}+1}{2}$

Q65. The coefficient of x^{101} in the expression
$5+x^{500}+x5+x^{499}+x^{2}5+x^{498}+\ldots \ldots+x^{500}, x>0$ is
(1) ${}^{501}C_{101} \times 5^{399}$ (2) ${}^{501}C_{101} \times 5^{400}$
(3) ${}^{501}C_{100} \times 5^{400}$ (4) ${}^{500}C_{101} \times 5^{399}$

Q66. The value of $2\sin 12° - \sin 72°$ is
(1) $\frac{\sqrt{5}1-\sqrt{3}}{4}$ (2) $\frac{1-\sqrt{5}}{8}$
(3) $\frac{\sqrt{3}1-\sqrt{5}}{2}$ (4) $\frac{\sqrt{3}1-\sqrt{5}}{4}$

Q67. A circle touches both the y-axis and the line $x+y=0$. Then the locus of its center
(1) $y=\sqrt{2}x$ (2) $x=\sqrt{2}y$..
(3) $y^2 - x^2 = 2xy$ (4) $x^2-y^2=2xy$

Q68. The line $y=x+1$ meets the ellipse $\frac{x^2}{4}+\frac{y^2}{2}=1$ at two points P and Q. If r is the radius of the circle with PQ as diameter then $3r^2$ is equal to
(1) 20 (2) 12
(3) 11 (4) 8

Q69. $\lim_{x \to \frac{\pi}{2}} \tan^2 x 2\sin^2 x + 3\sin x + 4^{\frac{1}{2}} - \sin^2 x + 6\sin x + 2^{\frac{1}{2}}$ is equal to
(1) $\frac{1}{12}$ (2) $-\frac{1}{18}$
(3) $-\frac{1}{12}$ (4) $\frac{1}{6}$

Q70. The negation of the Boolean expression $\sim q \wedge p \Rightarrow \sim p \vee q$ is logically equivalent to
(1) $p \Rightarrow q$ (2) $q \Rightarrow p$
(3) $\sim p \Rightarrow q$ (4) $\sim q \Rightarrow p$

Q71. The system of equations
$-kx+3y-14z=25$
$-15x+4y-kz=3$
$-4x+y+3z=4$
Question: is consistent for all k in the set
(1) R (2) $R - -11, 13$
(3) $R - -13$ (4) $R - -11, 11$

Q72. The value of $\tan^{-1}\frac{\cos\frac{15\pi}{4}-1}{\sin\frac{\pi}{4}}$ is equal to
(1) $-\frac{\pi}{4}$ (2) $-\frac{\pi}{8}$
(3) $-\frac{5\pi}{12}$ (4) $-\frac{4\pi}{9}$

Q73. Water is being filled at the rate of $1\text{cm}^3\text{sec}^{-1}$ in a right circular conical vessel (vertex downwards) of height 35cm and diameter 14cm. When the height of the water level is 10cm, the rate (in cm^2 sec^{-1}) at which the

wet conical surface area of the vessel increases is

(1) 5 (2) $\frac{\sqrt{21}}{5}$

(3) $\frac{\sqrt{26}}{5}$ (4) $\frac{\sqrt{26}}{10}$

Q74. If the line $y = 4 + kx, \quad k > 0$, is the tangent to the parabola $y = x - x^2$ at the point P and V is the vertex of the parabola, then the slope of the line through P and V is

(1) $\frac{3}{2}$ (2) $\frac{26}{9}$

(3) $\frac{5}{2}$ (4) $\frac{23}{6}$

Q75. If the angle made by the tangent at the point x_0, y_0 on the curve $x = 12t + \sin t \cos t$, $y = 121 + \sin t^2, 0 < t < \frac{\pi}{2}$, with the positive x-axis is $\frac{\pi}{3}$, then y_0 is equal to

(1) $63 + 2\sqrt{2}$ (2) $37 + 4\sqrt{3}$

(3) 27 (4) 48

Q76. If $b_n = \int_0^{\frac{\pi}{2}} \frac{\cos^2 nx}{\sin x} dx, n \in \mathbb{N}$, then

(1) $b_3 - b_2, b_4 - b_3, b_5 - b_4$ are in an A.P. with common difference-2

(2) $\frac{1}{b_3 - b_2}, \frac{1}{b_4 - b_3}, \frac{1}{b_5 - b_4}$ are in an A.P. with common difference 2

(3) $b_3 - b_2, b_4 - b_3, b_5 - b_4$ are in a G.P.

(4) $\frac{1}{b_3 - b_2}, \frac{1}{b_4 - b_3}, \frac{1}{b_5 - b_4}$ are in an A.P. with common difference -2

Q77. The area of the region enclosed between the parabolas $y^2 = 2x - 1$ and $y^2 = 4x - 3$ is.

(1) $\frac{1}{3}$ (2) $\frac{1}{6}$

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

Q78. If $y = yx$ is the solution of the differential equation $2x^2 \frac{dy}{dx} - 2xy + 3y^2 = 0$ such that $ye = \frac{e}{3}$, then $y1$ is equal to

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

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

Q79. Let P be the plane passing through the intersection of the planes $\vec{r} \cdot \hat{i} + 3\hat{j} - \hat{k} = 5$ and $\vec{r} \cdot 2\hat{i} - \hat{j} + \hat{k} = 3$, and the point $2, 1, -2$. Let the position vectors of the points X and Y be $\hat{i} - 2\hat{j} + 4\hat{k}$ and $5\hat{i} - \hat{j} + 2\hat{k}$ respectively. Then the points

(1) X and $X + Y$ are on the same side of P (2) Y and $Y - X$ are on the opposite sides of P

(3) X and Y are on the opposite sides of P (4) $X + Y$ and $X - Y$ are on the same side of P

Q80. A biased die is marked with numbers $2, 4, 8, 16, 32, 32$ on its faces and the probability of getting a face with mark n is $\frac{1}{n}$. If the die is thrown thrice, then the probability, that the sum of the numbers obtained is 48, is

(1) $\frac{7}{2^{11}}$ (2) $\frac{7}{2^{12}}$

(3) $\frac{3}{2^{10}}$ (4) $\frac{13}{2^{12}}$

Q81. The total number of three-digit numbers, with one digit repeated exactly two times, is _____.

Q82. If the sum of the co-efficients of all the positive even powers of x in the binomial expansion of $2x^3 + \frac{3}{x}^{10}$ is 5^{10} - $\beta \cdot 3^9$, then β is equal to _____.

Q83. Let the eccentricity of the hyperbola $\frac{x^2}{a^2}$ - $\frac{y^2}{b^2} = 1$ be $\frac{5}{4}$. If the equation of the normal at the point $\frac{8}{\sqrt{5}}, \frac{12}{5}$ on the hyperbola is $8\sqrt{5}x + \beta y = \lambda$, then λ - β is equal to _____.

Q84. If the mean deviation about the mean of the numbers $1, 2, 3,$ ... ... $, n$, where n is odd, is $\frac{5n+1}{n}$, then n is equal to _____.

Q85. Let $A = \begin{matrix} 2 & -2 \\ 1 & -1 \end{matrix}$ and$B = \begin{matrix} -1 & 2 \\ -1 & 2 \end{matrix}$. Then the number of elements in the set $\{n, m: n, m \in 1, 2,$ ... ... $. 10$ and $nA^n + mB^m = I\}$ is _____.

Q86. Let $fx = 2x^2 + 1$ and $gx = \begin{matrix} 2x - 3, & x < 0 \\ 2x + 3, & x \geq 0 \end{matrix}$, where t is the greatest integer $\leq t$. Then, in the open interval $-1, 1$, the number of points where fog is discontinuous is equal to _____.

Q87. Let $fx = x - 1x^2 - 2x - 3 + x - 3, x \in \mathbb{R}$. If m and M are respectively the number of points of local minimum and local maximum of f in the interval $0, 4$, then $m + M$ is equal to _____.

Q88. The value of $b > 3$ for which $12\int_3^b \frac{1}{x^2 - 1x^2 - 4}dx = \log_e \frac{49}{40}$, is equal to _____.

Q89. Let $\vec{b} = \hat{i} + \hat{j} + \lambda\hat{k}, \lambda \in \mathbb{R}$. If $\vec{a}$ is a vector such that $\vec{a} \times \vec{b} = 13\hat{i} - \hat{j} - 4\hat{k}$ and $\vec{a} \cdot \vec{b} + 21 = 0$, then $\vec{b} - \vec{a} \cdot \hat{k} - \hat{j} + \vec{b} + \vec{a} \cdot \hat{i} - \hat{k}$ is equal to

Q90. Let l_1 be the line in xy-plane with x and y intercepts $\frac{1}{8}$ and $\frac{1}{4\sqrt{2}}$ respectively, and l_2 be the line in zx-plane with x and z intercepts $-\frac{1}{8}$ and $-\frac{1}{6\sqrt{3}}$ respectively. If d is the shortest distance between the line l_1 and l_2, then d^{-2} is equal to _____.

ANSWER KEYS

1. (4)	**2.** (1)	**3.** (2)	**4.** (3)	**5.** (2)	**6.** (3)	**7.** (2)	**8.** (2)
9. (3)	**10.** (4)	**11.** (1)	**12.** (4)	**13.** (1)	**14.** (1)	**15.** (2)	**16.** (4)
17. (2)	**18.** (2)	**19.** (1)	**20.** (2)	**21.** (18)	**22.** (24)	**23.** (12)	**24.** (5)
25. (2)	**26.** (250)	**27.** (198)	**28.** (300)	**29.** (22)	**30.** (15)	**31.** (1)	**32.** (2)
33. (3)	**34.** (1)	**35.** (4)	**36.** (1)	**37.** (4)	**38.** (3)	**39.** (4)	**40.** (4)
41. (1)	**42.** (2)	**43.** (2)	**44.** (1)	**45.** (4)	**46.** (3)	**47.** (2)	**48.** (2)
49. (1)	**50.** (2)	**51.** (25)	**52.** (3)	**53.** (32)	**54.** (3)	**55.** (20)	**56.** (0)
57. (3)	**58.** (2)	**59.** (9)	**60.** (2)	**61.** (2)	**62.** (2)	**63.** (3)	**64.** (2)
65. (1)	**66.** (4)	**67.** (4)	**68.** (1)	**69.** (1)	**70.** (3)	**71.** (4)	**72.** (2)
73. (3)	**74.** (3)	**75.** (3)	**76.** (4)	**77.** (1)	**78.** (2)	**79.** (3)	**80.** (4)
81. (243)	**82.** (83)	**83.** (85)	**84.** (21)	**85.** (1)	**86.** (62)	**87.** (3)	**88.** (6)
89. (14)	**90.** (51)						