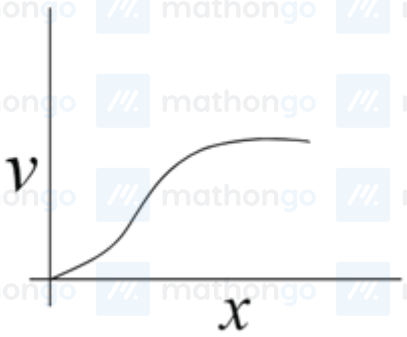
Q1. A simple pendulum is being used to determine the value of gravitational acceleration g at a certain place. The length of the pendulum is 25.0 cm and a stopwatch with 1 s resolution measures the time taken for 40 oscillations to be 50 s. The accuracy in g is:

(1) 5.40% (2) 3.40%

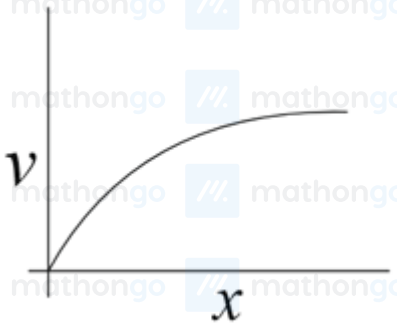
(3) 4.40% (4) 2.40%

Q2. A particle of mass m and charge q is released from rest in a uniform electric field. If there is no other force on the particle, the dependence of its speed v on the distance x travelled by it is correctly given by (graphs are schematic and not drawn to scale)

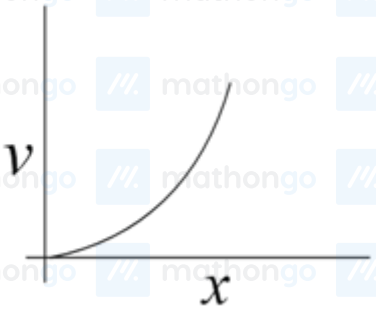
(1)



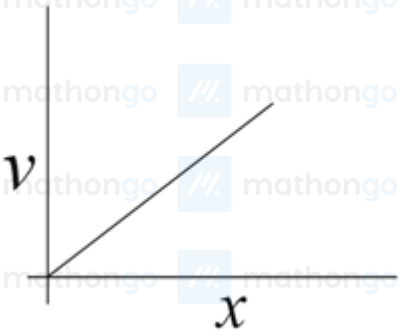
(2)



(3)



(4)



Q3. A particle moves such that its position vector $\vec{r}(t) = \cos\omega t\hat{i} + \sin\omega t\hat{j}$ where ω is a constant and t is time. Then which of the following statements is true for the velocity $\vec{v}(t)$ and acceleration $\vec{a}(t)$ of the particle:

(1) $\vec{v}$ is perpendicular to $\vec{r}$ and $\vec{a}$ is directed away from the origin

(2) $\vec{v}$ and $\vec{a}$ both are perpendicular to $\vec{r}$

(3) $\vec{v}$ and $\vec{a}$ both are parallel to $\vec{r}$

(4) $\vec{v}$ is perpendicular to $\vec{r}$ and $\vec{a}$ is directed towards the origin

Q4. As shown in figure. When a spherical cavity (centred at O) of radius 1 is cut out of a uniform sphere of radius R (centred at C), the centre of mass of remaining (shaded part of sphere is at G, i.e., on the surface of the

cavity. R can be determined by the equation:

(1) $\left(R^2+R+1\right)(2-R)=1$ (2) $\left(R^2-R-1\right)(2-R)=1$
(3) $\left(R^2-R+1\right)(2-R)=1$ (4) $\left(R^2+R-1\right)(2-R)=1$

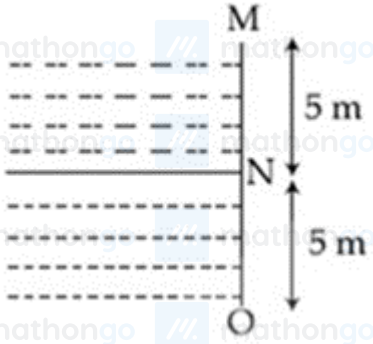
Q5. A particle of mass m is dropped from a height h above the ground. At the same time another particle of the same mass is thrown vertically upwards from the ground with a speed of $\sqrt{2gh}$. If they collide head-on completely inelastically, the time taken for the combined mass to reach the ground, in units of $\sqrt{\frac{h}{g}}$ is:

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

Q6. A uniform sphere of mass 500 g rolls without slipping on a plane horizontal surface with its centre moving at a speed of $5.00\ \text{cm s}^{-1}$. Its kinetic energy is:

(1) 8.75×10^{-4} J (2) 8.75×10^{-3} J
(3) 6.25×10^{-4} J (4) 1.13×10^{-3} J

Q7.



Two liquids of densities ρ_1 and $\rho_2(\rho_2=2\rho_1)$ are filled up behind a square wall of side 10m as shown in figure. Each liquid has a height of 5m. The ratio of the forces due to these liquids exerted on upper part MN to that at the lower part NO is (Assume that the liquids are not mixing):

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

Q8. A Carnot engine having an efficiency of $\frac{1}{10}$ is being used as a refrigerator. If the work done on the refrigerator is 10 J, the amount of heat absorbed from the reservoir at a lower temperature is

(1) 99 J (2) 100 J
(3) 1 J (4) 90 J

Q9. Consider a mixture of n moles of helium gas and $2n$ moles of oxygen gas (molecules taken to be rigid) as an ideal gas. Its $\frac{C_P}{C_V}$ value will be:

(1) $\frac{19}{13}$ (2) $\frac{67}{45}$
(3) $\frac{40}{27}$ (4) $\frac{23}{15}$

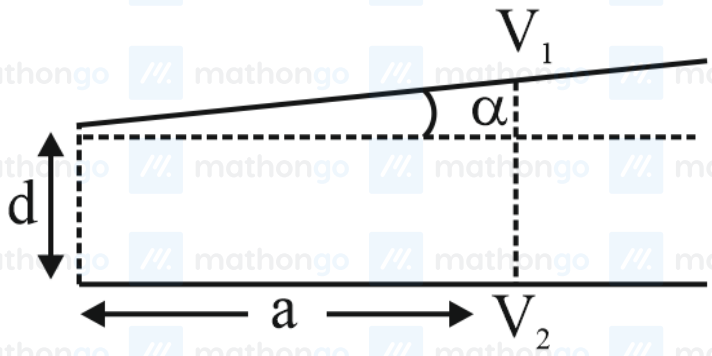
Q10. A transverse wave travels on a taut steel wire with a velocity of v when tension in it is 2.06×10^4N. When the tension is changed to T, the velocity changed to $\frac{v}{2}$. The value of T is close to:

(1) 2.50×10^4N (2) 5.15×10^3 N
(3) 30.5×10^4 N (4) 10.2×10^2 N

Q11. Consider two charged metallic spheres S_1 and S_2 of radii R_1 and R_2, respectively. The electric fields E_1 (on S_1) and E_2 (on S_2) on their surfaces are such that $\frac{E_1}{E_2} = \frac{R_1}{R_2}$. Then the ratio V_1 (on S_1)/V_2 (on S_2) of the electrostatic potentials on each sphere is:

(1) $\frac{R_1}{R_2}$ (2) $\left(\frac{R_1}{R_2}\right)^2$
(3) $\left(\frac{R_2}{R_1}\right)$ (4) $\left(\frac{R_1}{R_2}\right)^3$

Q12. A capacitor is made of two square plates each of side ' a ' making a very small angle α between them, as shown in figure. The capacitance will be close to:



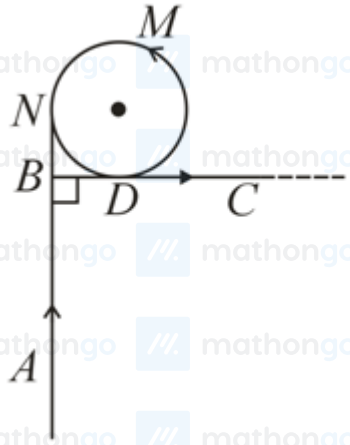
(1) $\frac{\in_0 a^2}{d}\left(1-\frac{\alpha a}{2d}\right)$ (2) $\frac{\in_0 a^2}{d}\left(1-\frac{\alpha a}{4d}\right)$
(3) $\frac{\in_0 a^2}{d}\left(1+\frac{\alpha a}{d}\right)$ (4) $\frac{\in_0 a^2}{d}\left(1-\frac{3\alpha a}{2d}\right)$

Q13. A galvanometer having a coil resistance 100 Ω gives a full scale deflection when a current of 1mA is passed through it. What is the value of the resistance which can convert this galvanometer into a voltmeter given full scale deflection for a potential difference of 10V?

(1) 10kΩ (2) 8.9 kΩ
(3) 7.9 kΩ (4) 9.9 kΩ

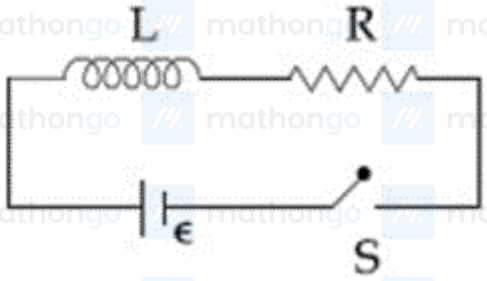
Q14. A very long wire ABDMNDC is shown in figure carrying current I. AB and BC parts are straight, long and at right angle. At D wire forms a circular turn DMND of radius R. AB, BC parts are tangential to circular turn at

N and D. Magnetic filed at the center of circle is:



(1) $\frac{\mu_0 I}{2\pi R}\left(\pi+\frac{1}{\sqrt{2}}\right)$ (2) $\frac{\mu_0 I}{2\pi R}\left(\pi-\frac{1}{\sqrt{2}}\right)$
(3) $\frac{\mu_0 I}{2\pi R}(\pi+1)$ (4) $\frac{\mu_0 I}{2R}$

Q15.



As shown in the figure, a battery of emf $\in$ is connected to an inductor L and resistance R in series. The switch is closed at $t=0$. The total charge that flows from the battery, between $t=0$ and $t=t_c$ (t_c is the time constant of the circuit) is:

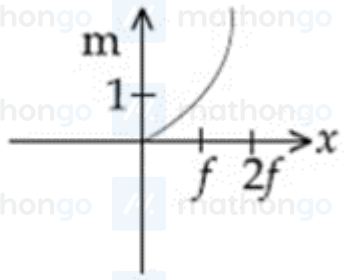
(1) $\frac{\in L}{eR^2}$ (2) $\frac{\in L}{R^2}\left(1-\frac{1}{e}\right)$
(3) $\frac{\in L}{R^2}$ (4) $\frac{\in R}{eL^2}$

Q16. A plane electromagnetic wave of frequency 25GHz is propagating in vacuum along the z-direction. At a particular point in space and time, the magnetic filed is given by $\overrightarrow{B}=5\times10^{-8}\,\hat{j}\,T$. The corresponding electric field $\overrightarrow{E}$ is (speed of light $=3\times10^8\,\mathrm{m\,s^{-1}}$)

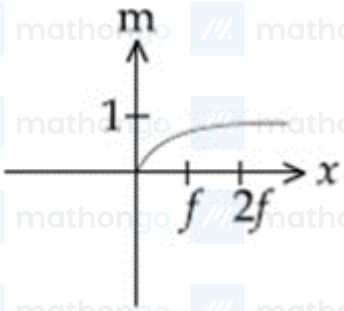
(1) $1.66\times10^{-16}\hat{i}\,\frac{\mathrm{V}}{\mathrm{m}}$ (2) $-1.66\times10^{-16}\hat{i}\,\frac{V}{m}$
(3) $-15\hat{i}\,\frac{\mathrm{V}}{\mathrm{m}}$ (4) $15\hat{i}\,\frac{\mathrm{V}}{\mathrm{m}}$

Q17. An object is gradually moving away from the focal point of a concave mirror along the axis of the mirror. The graphical representation of the magnitude of linear magnification (m) versus distance of the object from the mirror (x) is correctly given by
(Graphs are drawn schematically and are not to scale)

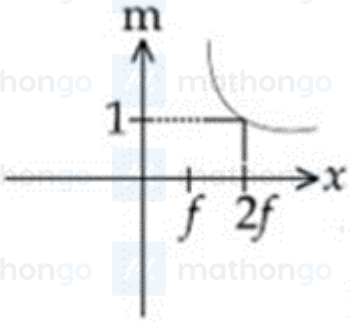
(1)



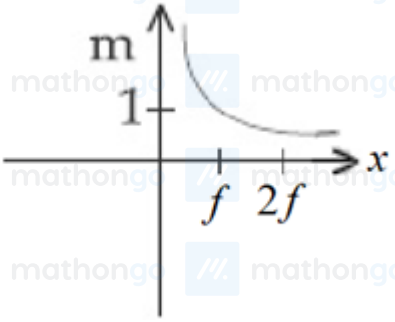
(2)



(3)



(4)



Q18. In a double – slit experiment, at a certain point on the screen the path difference between the two interfering waves is $\frac{1}{8}$th of a wavelength. The ratio of the intensity of light at that point to that at the center of a bright fringe is:

(1) 0.853 (2) 0.672

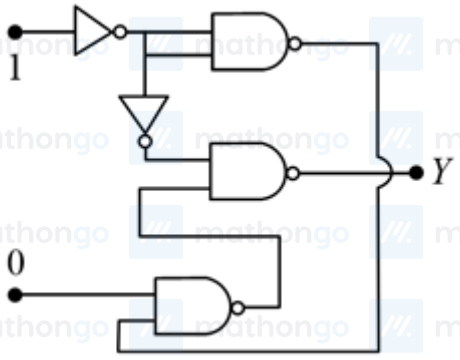
(3) 0.568 (4) 0.760

Q19. An electron (mass m) with initial velocity $\vec{v} = v_0\hat{i} + v_0\hat{j}$ is in an electric filed $\vec{E} = -E_0\hat{k}$. If λ_0 is initial de-Broglie wavelength of electron, its de-Broglie wave length at time t is given by:

(1) $\frac{\lambda_0\sqrt{2}}{\sqrt{1+\frac{e^2E^2t^2}{m^2v_0^2}}}$ (2) $\frac{\lambda_0}{\sqrt{1+\frac{e^2E^2t^2}{m^2v_0^2}}}$

(3) $\frac{\lambda_0}{\sqrt{1+\frac{e^2E^2t^2}{2m^2v_0^2}}}$ (4) $\frac{\lambda_0}{\sqrt{2+\frac{e^2E^2t^2}{m^2v_0^2}}}$

Q20. In the given circuit, value of Y is:



(1) 0 (2) toggles between 0 and 1

(3) will not execute (4) 1

Q21. A ball is dropped from the top of a 100 m high tower on a planet. In the last $\frac{1}{2}$s before hitting the ground, it covers a distance of 19 m. Acceleration due to gravity (in m s^{-2}) near the surface on that planet is_____

Q22. An asteroid is moving directly towards the centre of the earth. When at a distance of $10R$ (R is the radius of the earth) from the centre of the earth, it has a speed of 12 km s^{-1}. Neglecting the effect of earth's atmosphere, what will be the speed of the asteroid when it hits the surface of the earth (escape velocity from the earth is 11.2 km s^{-1}) ? Give your answer to the nearest integer in km s^{-1}_____.

Q23. Three containers C_1, C_2 and C_3 have water at different temperatures. The table below shows the final temperature T when different amounts of water (given in liters) are taken from each container and mixed (assume no loss of heat during the process)

C_1	C_2	C_3	T
$1l$	$2l$	$--$	$60^{o}C$
$--$	$1l$	$2l$	$30^{o}C$
$2l$	$--$	$1l$	$60^{o}C$
$1l$	$1l$	$1l$	θ

The value of θ (in ^{o}C to the nearest integer) is_____

Q24. The series combination of two batteries, both of the same emf 10V, but different internal resistance of $20\,\Omega$ and $5\,\Omega$, is connected to the parallel combination of two resistors $30\,\Omega$ and $x\,\Omega$. The voltage difference across the battery of internal resistance $20\,\Omega$ is zero, the value of x (in Ω) is____

Q25. The first member of the Balmer series of hydrogen atom has a wavelength of 6561 $\mathring{A}$. The wavelength of the second member of the Balmer series (in nm) is_____

Q26. Preparation of Bakelite proceeds via reactions:

(1) Electrophilic addition and dehydration (2) Condensation and elimination

(3) Electrophilic substitution and dehydration (4) Nucleophilic addition and dehydration

Q27. The increasing order of the atomic radii of the following elements is:

$(a) C$

$(b) O$

$(c) F$

$(d) Cl$

$(e) Br$

(1) $(b) < (c) < (d) < (a) < (e)$ (2) $(d) < (c) < (b) < (a) < (e)$

(3) $(c) < (b) < (a) < (d) < (e)$ (4) $(a) < (b) < (c) < (d) < (e)$

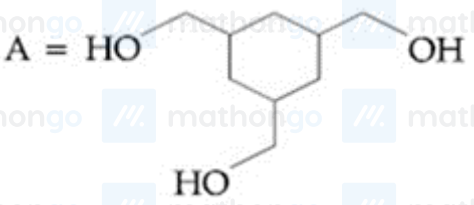
Q28. Arrange the following bonds according to their average bond energies in descending order:

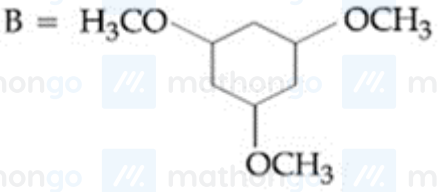
$C-Cl, C-Br, C-F, C-I$

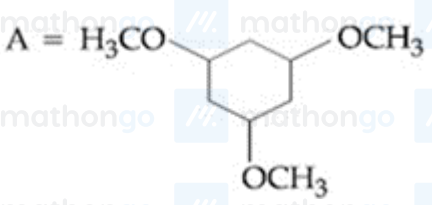
(1) $C-F > C-Cl > C-Br > C-I$ (2) $C-Br > C-I > C-Cl > C-F$

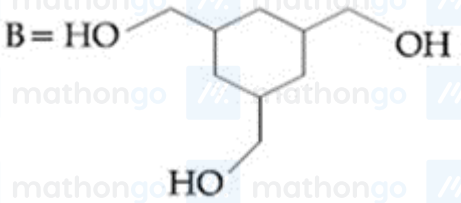
(3) $C-I > C-Br > C-Cl > C-F$ (4) $C-Cl > C-Br > C-I > C-F$

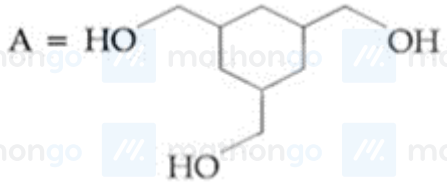
Q29. Among the compounds A and B with molecular formula $C_9H_{18}O_3$, A is having higher boiling point than B. The possible structures of A and B are:

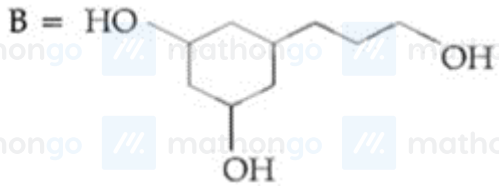
(1) 

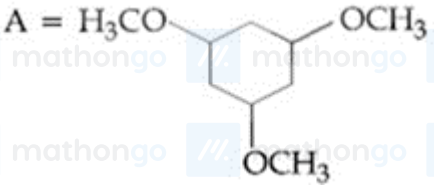


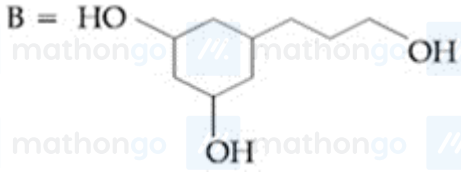
(2) 



(3) 



(4) 



Q30. For the following Assertion and Reason, the correct option is:

Assertion: The pH of water increases with increase in temperature.

Reason: The dissociation of water into H^+ and OH^- is an exothermic reaction.

(1) Both assertion and reason are true, and the reason is the correct explanation for the assertion.

(2) Both assertion and reason are false.

(3) Both assertion and reason are true, but the reason is not the correct explanation for the assertion.

(4) Assertion is not true, but reason is true.

Q31. Among the reactions $(a)-(d)$, the reaction(s) that does/do not occur in the blast furnace during the extraction of iron is/are:

(a) $CaO + SiO_2 \rightarrow CaSiO_3$

(b) $3Fe_2O_3 + CO \rightarrow 2Fe_3O_4 + CO_2$

(c) $FeO + SiO_2 \rightarrow FeSiO_3$

(d) $FeO \rightarrow Fe + \frac{1}{2}O_2$

(1) a

(2) a and d

(3) c and d

(4) d

Q32. The radius of the second Bohr orbit, in terms of the Bohr radius, a_0, in Li^{2+} is:

(1) $\frac{2a_0}{3}$

(2) $\frac{4a_0}{9}$

(3) $\frac{4a_0}{3}$

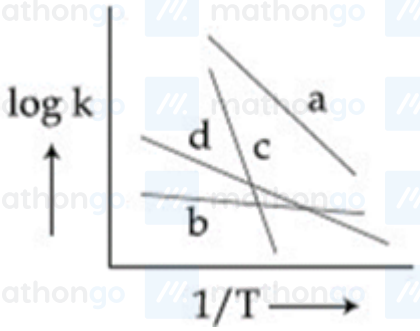
(4) $\frac{2a_0}{9}$

Q33. Kjeldahl's method cannot be used to estimate nitrogen for which of the following compounds?

(1) $C_6H_5NH_2$ (2) $CH_3CH_2-C\equiv N$

(3) $C_6H_5NO_2$ (4) $NH_2-\overset{\overset{O}{\|}}{C}-NH_2$

Q34. Consider the following plots of rate constant versus $\frac{1}{T}$ for four different reactions. Which of the following orders is correct for the activation energies of these reactions?

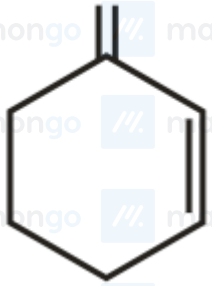


(1) $E_b > E_a > E_d > E_c$ (2) $E_a > E_c > E_d > E_b$

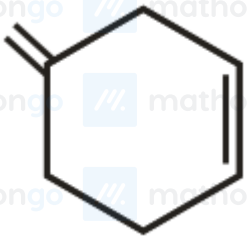
(3) $E_c > E_a > E_d > E_b$ (4) $E_b > E_d > E_c > E_a$

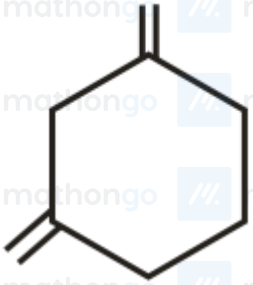
Q35. An unsaturated hydrocarbon X absorbs two hydrogen molecules on catalytic hydrogenation, and also gives following reaction:

$X \xrightarrow[\substack{(ii)\,Zn\\H_2O}]{(i)O_3} A \xrightarrow{[Ag(NH_3)_2]^+} B$ (3-oxo-hexanedicarboxylic acid) X will be:

(1) 

(2) 

(3) 

(4) 

Q36. Which of the following compounds is likely to show both Frenkel and Schottky defects in its crystalline form?

(1) AgBr (2) CsCl

(3) KBr (4) ZnS

Q37. Among $(a)-(d)$, the complexes that can show geometrical isomerism are:

(a) $[Pt(NH_3)_3Cl]^+$

(b) $[Pt(NH_3)Cl_5]^-$

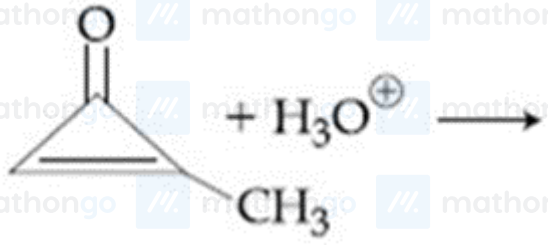
(c) $[Pt(NH_3)_2Cl(NO_2)]$

(d) $[Pt(NH_3)_4ClBr]^{2+}$

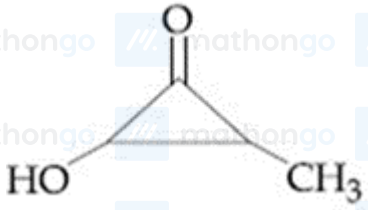
(1) b and c (2) d and a

(3) c and d (4) a and b

Q38. The major product in the following reaction is:



(1)



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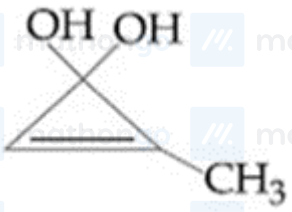
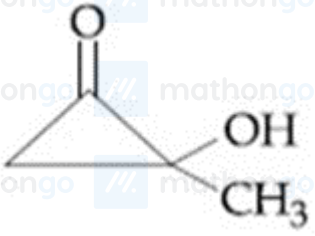
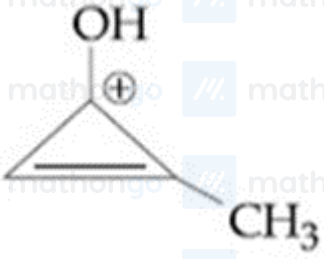


(3)



(4)



Q39. White phosphorus on reaction with concentrated $NaOH$ solution in an inert atmosphere of CO_2 gives phosphine and compound (X). (X) on acidification with HCl gives compound (Y). The basicity of compound (Y) is:

(1) 2 (2) 1

(3) 4 (4) 3

Q40. Hydrogen has three isotopes (A), (B) and (C). If the number of neutron(s) in (A), (B) and (C) respectively, are (x), (y) and (z), the sum of (x), (y) and (z) is

(1) 3 (2) 2

(3) 4 (4) 1

Q41. A metal (A) on heating in nitrogen gas gives compound B. B on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a dark blue-violet coloured solution. A and B respectively, are:

(1) Na and $NaNO_3$ (2) Na and Mg_3N_2

(3) Mg and Mg_3N_2 (4) Mg and $Mg(NO_3)_2$

Q42. The major product [B] in the following sequence of reactions is:

$$CH_3-\underset{\underset{CH(CH_3)_2}{|}}{C}=CH-CH_2CH_3 \xrightarrow[(ii)\ H_2O_2,\ OH^{\ominus}]{(i)\ B_2H_6} [A] \xrightarrow[\Delta]{dil.\ H_2SO_4} [B]$$

(1) $CH_2=\underset{\underset{CH(CH_3)_2}{|}}{C}-CH_2CH_2CH_3$

(2) $CH_3-\underset{\underset{H_3C\quad CH_3}{\diagdown\ \diagup}}{\overset{\overset{||}{C}}{|}}-CH_2CH_2CH_3$

(3) $CH_3-\underset{\underset{CH(CH_3)_2}{|}}{C}=CH-CH_2CH_3$

(4) $CH_3-\underset{\underset{CH(CH_3)_2}{|}}{CH}-CH=CH-CH_3$

Q43. The correct order of the calculated spin-only magnetic moments of complexes (A) to (D) is:

(A) $Ni(CO)_4$

(B) $[Ni(H_2O)_6]Cl_2$

(C) $Na_2[Ni(CN)_4]$

(D) $PdCl_2(PPh_3)_2$

(1) $(A) \approx (C) < (B) \approx (D)$

(2) $(C) < (D) < (B) < (A)$

(3) $(C) \approx (D) < (B) < (A)$

(4) $(A) \approx (C) \approx (D) < (B)$

Q44. Two monomers in maltose are:

(1) $\alpha - D-$ glucose and $\beta - D-$ glucose

(2) $\alpha - D-$ glucose and $\alpha - D-$ galactose

(3) $\alpha - D-$ glucose and $\alpha - D-$ Fructose

(4) $\alpha - D-$ glucose and $\alpha - D-$ glucose

Q45. For the following Assertion and Reason, the correct option is:

Assertion: For hydrogenation reactions, the catalytic activity increases from Group 5 to Group 11 metals with maximum activity shown by Group $7-9$ elements.

Reason: The reactants are most strongly adsorbed on group $7-9$ elements.

(1) The assertion is true, but the reason is false

(2) Both assertion and reason are false

(3) Both assertion and reason are true and the reason is the correct explanation for the assertion

(4) Both assertion and reason are true but the reason is not the correct explanation for the assertion

Q46. $NaClO_3$ is used, even in spacecrafts, to produce O_2. The daily consumption of pure O_2 by a person in 492 L at 1 atm, 300K. How much amount of $NaClO_3$, in grams, is required to produce O_2 for the daily consumption of a person at 1 atm, 300K ? _____

$NaClO_3(s) + Fe(s) \rightarrow O_2(g) + NaCl(s) + FeO(s)$

$R = 0.082\ L\ atm\ mol^{-1}\ K^{-1}$

Q47. At constant volume, 4 mol of an ideal gas when heated from 300K to 500K changes its internal energy by 5000J. The molar heat capacity at constant volume is _____

Q48. In the following sequence of reactions the maximum number of atoms present in molecule ' C ' in one plane is_____

$$A \xrightarrow[\text{Cu tube}]{\text{Red hot}} B \xrightarrow[\text{Anhydrous } AlCl_3]{CH_3Cl(1.eq)} C$$

(A is a lowest molecular weight alkyne)

Q49. For an electrochemical cell $Sn(s)\left|Sn^{2}+(aq,\ 1M)\right|\left|Pb^{2+}(aq,\ 1M)\right|Pb(s)$ the ratio $\frac{\left[Sn^{2+}\right]}{\left[Pb^{2+}\right]}$ when this cell attains equilibrium is _____

(Given: $E^{0}_{Sn^{2+}|Sn}=-0.14\ V, E^{0}_{Pb^{2+}|Pb}=-0.13\ V,\ \frac{2.303RT}{F}=0.06$)

Q50. Complexes (ML_5) of metals Ni and Fe have ideal square pyramidal and trigonal bipyramidal geometries, respectively. The sum of the $90^{o}, 120^{o}$ and 180^{o} L – M – L angles in the two complexes is_____

Q51. Let S, be the set of all real roots of the equation, $3^{x}(3^{x}-1)+2=|3^{x}-1|+|3^{x}-2|$, then

(1) contains exactly two elements.
(2) is a singleton.
(3) is an empty set.
(4) contains at least four elements.

Q52. Let $\alpha=\frac{-1+i\sqrt{3}}{2}$. If $a=(1+\alpha)\sum_{k=0}^{100}\alpha^{2k}$ and $b=\sum_{k=0}^{100}\alpha^{3k}$, then a and b, are the roots of the quadratic equation.

(1) $x^2+101x+100=0$
(2) $x^2-102x+101=0$
(3) $x^2-101x+100=0$
(4) $x^2+102x+101=0$

Q53. If the 10^{th}, term of an A.P. is $\frac{1}{20}$, and its 20^{th}, term is $\frac{1}{10}$, then the sum of its first 200, terms is.

(1) 50
(2) $50\frac{1}{4}$
(3) 100
(4) $100\frac{1}{2}$

Q54. If α and β, be the coefficients of x^4 and x^2, respectively in the expansion of $\left(x+\sqrt{x^2-1}\right)^6+\left(x-\sqrt{x^2-1}\right)^6$, then

(1) $\alpha+\beta=60$
(2) $\alpha+\beta=-30$
(3) $\alpha-\beta=60$
(4) $\alpha-\beta=-132$

Q55. If a line $y=mx+c$, is a tangent to the circle $(x-3)^2+y^2=1$, and it is perpendicular to a line L_1, where L_1 is the tangent to the circle $x^2+y^2=1$, at the point $\left(\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}\right)$, then

(1) $c^2-7c+6=0$
(2) $c^2+7c+6=0$
(3) $c^2+6c+7=0$
(4) $c^2-6c+7=0$

Q56. If a hyperbola passes through the point $P(10,\ 16)$, and it has vertices at $(\pm 6,\ 0)$, then the equation of the normal to it at P, is.

(1) $3x+4y=94$
(2) $2x+5y=100$
(3) $x+2y=42$
(4) $x+3y=58$

Q57. Which of the following statement is a tautology?

(1) $p\vee(\sim q)\rightarrow p\wedge q$
(2) $\sim(p\wedge\sim q)\rightarrow p\vee q$
(3) $\sim(p\vee\sim q)\rightarrow p\wedge q$
(4) $\sim(p\vee\sim q)\rightarrow p\vee q$

Q58. The mean and variance of 20 observations are found to be 10 and 4, respectively. On rechecking, it was found that an observation 9 was incorrect and the correct observation was 11, then the correct variance is

(1) 3.99 (2) 4.01

(3) 4.02 (4) 3.98

Q59. If $A = \begin{pmatrix} 2 & 2 \\ 9 & 4 \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then $10\,A^{-1}$, is equal to.

(1) $A - 4I$ (2) $6I - A$

(3) $A - 6I$ (4) $4I - A$

Q60. The system of linear equations

$\lambda x + 2y + 2z = 5$

$2\lambda x + 3y + 5z = 8$

$4x + \lambda y + 6z = 10$ has

(1) no solution when $\lambda = 8$ (2) a unique solution when $\lambda = -8$

(3) no solution when $\lambda = 2$ (4) infinitely many solutions when $\lambda = 2$

Q61. Let $f : (1,\ 3) \to R$, be a function defined by $f(x) = \frac{x[x]}{1+x^2}$, where $[x]$, denotes the greatest integer $\leq x$. Then the range of f, is

(1) $\left(\frac{2}{5},\ \frac{3}{5}\right] \cup \left(\frac{3}{4},\ \frac{4}{5}\right)$ (2) $\left(\frac{2}{5},\ \frac{1}{2}\right) \cup \left(\frac{3}{5},\ \frac{4}{5}\right]$

(3) $\left(\frac{2}{5},\ \frac{4}{5}\right]$ (4) $\left(\frac{3}{5},\ \frac{4}{5}\right)$

Q62. Let S, be the set of all functions $f : [0, 1] \to R$, which are continuous on $[0, 1]$, and differentiable on $(0, 1)$. Then for every f in S, there exists $c \in (0, 1)$, depending on f, such that.

(1) $|f(c) - f(1)| < (1 - c)\left|f'(c)\right|$ (2) $\frac{f(1)-f(c)}{1-c} = f'(c)$

(3) $|f(c) + f(1)| < (1 + c)\left|f'(c)\right|$ (4) $|f(c) - f(1)| < \left|f'(c)\right|$

Q63. The length of the perpendicular from the origin, on normal to the curve, $x^2 + 2xy - 3y^2 = 0$, at the point $(2,\ 2)$, is.

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

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

Q64. $\lim\limits_{x\to 0} \frac{\int_0^x t\sin(10t)dt}{x}$, is equal to

(1) 0 (2) $\frac{1}{10}$

(3) $-\frac{1}{5}$ (4) $-\frac{1}{10}$

Q65. If $I = \int\limits_1^2 \frac{dx}{\sqrt{2x^3-9x^2+12x+4}}$, then

(1) $\frac{1}{8} < I^2 < \frac{1}{4}$ (2) $\frac{1}{9} < I^2 < \frac{1}{8}$

(3) $\frac{1}{16} < I^2 < \frac{1}{9}$ (4) $\frac{1}{6} < I^2 < \frac{1}{2}$

Q66. The area (in sq. units) of the region $\left\{(x,\ y) \in R^2 : x^2 \leq y \leq 3 - 2x\right\}$, is.

(1) $\frac{32}{3}$ (2) $\frac{34}{3}$

(3) $\frac{29}{3}$ (4) $\frac{31}{3}$

Q67. The differential equation of the family of curves, $x^2 = 4b(y+b),\ b \in R$, is.

(1) $x\left(y'\right)^2 = x + 2yy'$ (2) $x\left(y'\right)^2 = 2yy' - x$

(3) $xy'' = y'$ (4) $x\left(y'\right)^2 = x - 2yy'$

Q68. Let $\vec{a} = \hat{i} - 2\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$, be two vectors. If $\vec{c}$, is a vector such that $\vec{b} \times \vec{c} = \vec{b} \times \vec{a}$ and $\vec{c} \cdot \vec{a} = 0$, then $\vec{c} \cdot \vec{b}$, is equal to.

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

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

Q69. The mirror image of the point $(1, 2, 3)$, in a plane is $\left(-\frac{7}{3}, -\frac{4}{3}, -\frac{1}{3}\right)$. Which of the following points lies on this plane?

(1) $(1,\ 1,\ 1)$ (2) $(1, -1,\ 1)$

(3) $(-1, -1,\ 1)$ (4) $(-1,\ -1,\ -1)$

Q70. Let A and B, be two events such that the probability that exactly one of them occurs is $\frac{2}{5}$, and the probability that A or B, occurs is $\frac{1}{2}$, then the probability of both of them occur together is.

(1) 0.02 (2) 0.20

(3) 0.01 (4) 0.10

Q71. The number of 4 letter words (with or without meaning) that can be formed from the eleven letters of the word EXAMINATION is

Q72. The sum, $\sum_{n=1}^{7} \frac{n(n+1)(2n+1)}{4}$, is equal to

Q73. If $\frac{\sqrt{2}\sin\alpha}{\sqrt{1+\cos 2\alpha}} = \frac{1}{7}$ and $\sqrt{\frac{1-\cos 2\beta}{2}} = \frac{1}{\sqrt{10}},\ \alpha, \beta \in \left(0, \frac{\pi}{2}\right)$, then $\tan(\alpha + 2\beta)$, is equal to

Q74. Let a line $y = mx (m > 0)$, intersect the parabola, $y^2 = x$, at a point $P,$ other than the origin. Let the tangent to it a P, meet the x-axis at the point Q. If area $(\Delta OPQ) = 4$ square unit, then m is equal to

Q75. Let $f(x)$, be a polynomial of degree 3, such that $f(-1) = 10,\ f(1) = -6,\ f(x)$, has a critical point at $x = -1$ and $f\prime(x)$, has a critical point at $x = 1$. Then $f(x)$, has local minima at $x =$

ANSWER KEYS

1. (3)	**2.** (2)	**3.** (4)	**4.** (1)	**5.** (4)	**6.** (1)	**7.** (4)	**8.** (4)
9. (1)	**10.** (2)	**11.** (2)	**12.** (1)	**13.** (4)	**14.** (1)	**15.** (1)	**16.** (4)
17. (3)	**18.** (1)	**19.** (3)	**20.** (1)	**21.** (8)	**22.** (16)	**23.** (50)	**24.** (30)
25. (486)	**26.** (3)	**27.** (3)	**28.** (1)	**29.** (1)	**30.** (2)	**31.** (3)	**32.** (3)
33. (3)	**34.** (3)	**35.** (3)	**36.** (1)	**37.** (3)	**38.** (4)	**39.** (2)	**40.** (1)
41. (3)	**42.** (2)	**43.** (4)	**44.** (4)	**45.** (1)	**46.** (2130)	**47.** (6.25)	**48.** (13)
49. (2.15)	**50.** (20)	**51.** (2)	**52.** (2)	**53.** (4)	**54.** (4)	**55.** (3)	**56.** (2)
57. (4)	**58.** (1)	**59.** (3)	**60.** (3)	**61.** (2)	**62.** (2)	**63.** (4)	**64.** (1)
65. (2)	**66.** (1)	**67.** (1)	**68.** (3)	**69.** (2)	**70.** (4)	**71.** (2454)	**72.** (504)
73. (1)	**74.** (0.5)	**75.** (3)					