Q1

The resistance of a wire is 20Ω. It is stretched, so that the length becomes three times, then the new resistance of the wire will be

(1) 200Ω

(2) 160Ω

(3) 120Ω

(4) 180Ω

Q2

A standing wave in a pipe with a length $L = 1.2$ m is described by
$y(x,t) = y_0 \sin[(2\pi/L)x] \sin[(2\pi/\mathrm{T})t + \pi/4]$
Based on above information, which one of the following statements is incorrect. (Speed of sound in air is 300 m s^{-1})-

(1) The pipe is closed at both ends

(2) The wavelength of the wave could be 1.2 m

(3) There could be a node at $x = 0$ and antinode at $x = \mathrm{L}/2$

(4) The frequency of the fundamental mode of vibrations is 137.5 Hz

Q3

300 cc of a gas at the atmospheric pressure of 10^6 dyne cm^{-2} is compressed to 150 cc. If the change is sudden, what is final pressure? Given $\gamma = 1.4$

(1) 1×10^6 dyne cm^{-2}

(2) 2.0×10^6 dyne cm^{-2}

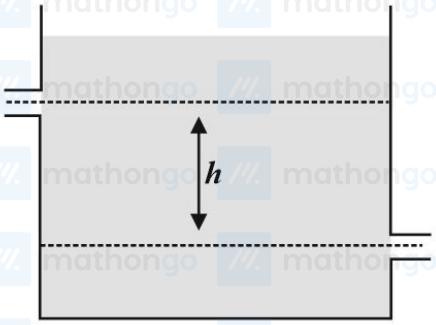
(3) 2.6×10^6 dyne cm^{-2}

(4) 3.0×10^6 dyne cm^{-2}

Q4

There are two identical small holes of area of cross-section A on the opposite sides of a tank containing a liquid of density ρ. The difference in height between the holes is h. Tank is resting on a smooth horizontal surface, horizontal

force which has to be applied on the tank to keep it in equilibrium is



(1) $\rho g h A$

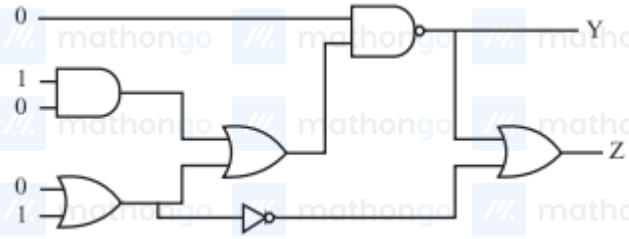
(2) $2gh/\rho A$

(3) $2\rho g h A$

(4) $\rho g h/A$

Q5

The values of Y and Z in the given logic circuit are



(1) $Y = 1, Z = 1$

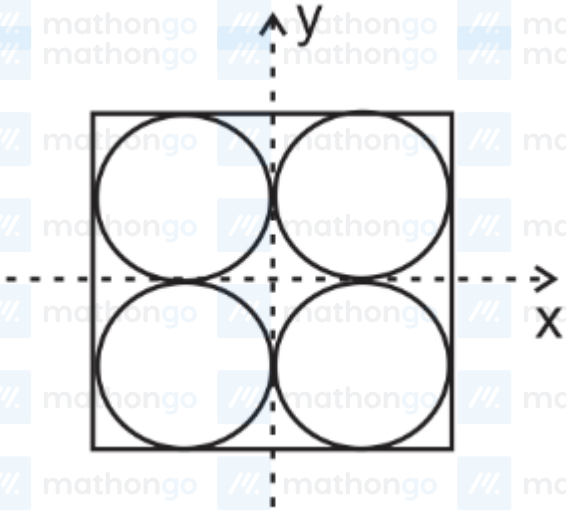
(2) $Y = 0, Z = 1$

(3) $Y = 1, Z = 0$

(4) $Y = 0, Z = 0$

Q6

Four holes of radius R are cut from a thin square plate of side 4R and mass M. The moment of inertia of the remaining portion about z-axis is



(1) $\frac{\pi}{12}MR^2$

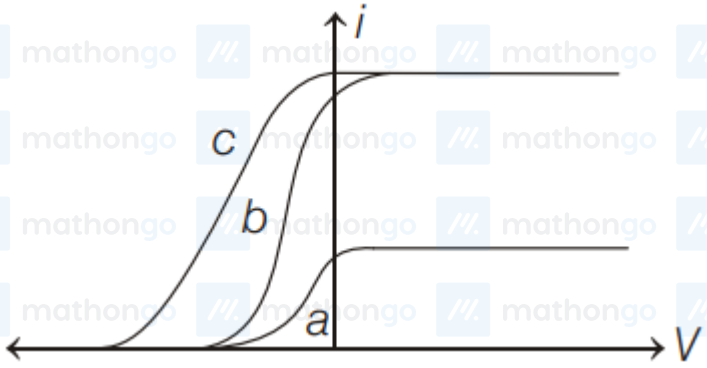
(2) $\left(\frac{4}{3}-\frac{\pi}{4}\right)MR^2$

(3) $\left(\frac{8}{3}-\frac{10\pi}{16}\right)MR^2$

(4) $\left(\frac{4}{3}-\frac{\pi}{6}\right)MR^2$

Q7

The figures shows the variation of photocurrent i with anode potential V for three different radiations. Let I_a, I_b and I_c be the intensities and f_a, f_b and f_c be the frequencies for the curves a, b and c respectively. Then



(1) $f_a = f_b$ and $I_a \neq I_b$

(2) $f_a = f_c$ and $I_a = I_c$

(3) $f_a = f_b$ and $I_a = I_b$

(4) $f_b = f_c$ and $I_b = I_c$

Q8

A liquid A of mass 100 g at 100°C is added to 50 g of a liquid B at temperature 75°C, the temperature of the mixture becomes 90°C. Now if 100 g of liquid A at 100°C is added to 50 g of liquid B at 50°C, temperature of the mixture will be

(1) 80°C

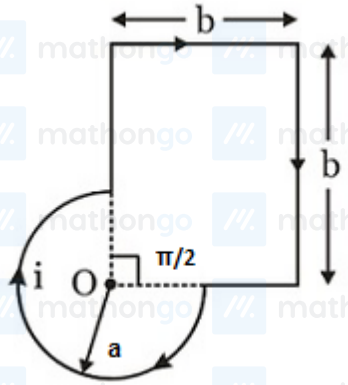
(2) 60°C

(3) 70°C

(4) 85°C

Q9

The magnitude of the magnetic field at O (centre of the circular part) due to the current-carrying coil as shown is:



(1) $\frac{\mu_0 i}{4\pi}\left(\frac{4\pi}{a}+\frac{\sqrt{2}}{b}\right)$

(2) $\frac{\mu_0 i}{4\pi}\left(\frac{3\pi}{2a}+\frac{\sqrt{2}}{b}\right)$

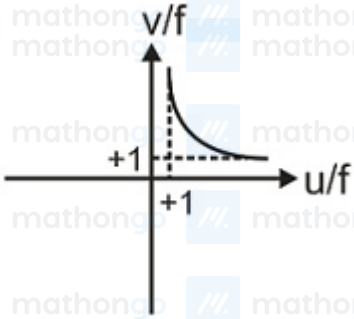
(3) $\frac{\mu_0 i}{2\pi}\left(\frac{\pi}{3a}+\frac{3}{\sqrt{2}b}\right)$

(4) $\frac{\mu_0 i}{4\pi}\left(\frac{3\pi}{a}+\frac{\sqrt{2}}{b}\right)$

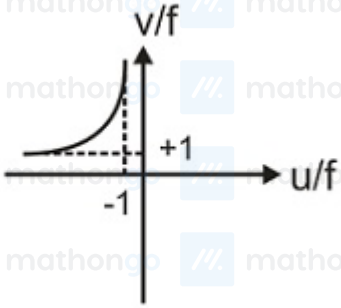
Q10

A real inverted image in a concave mirror is represented by graph (u, v, f are coordinates)

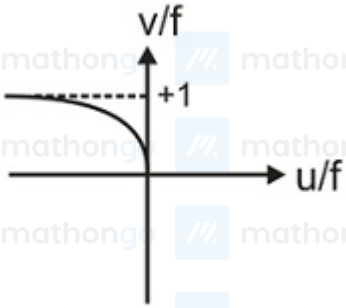
(1)



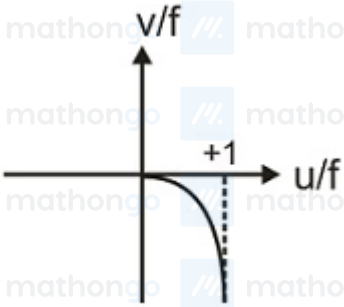
(2)



(3)



(4)



Q11

Match the electromagnetic radiations given in List -I with their uses given in List - II.

List - I		List - II
A) X-rays	P)	Remote switches
B) UV-rays	Q)	Finger prints in forensic Labs
C) Radio waves	R)	Crystal structure study
D) IR - rays	S)	TV communication system.

(1) $\mathrm{A} \rightarrow \mathrm{Q}, \mathrm{B} \rightarrow \mathrm{R}, \mathrm{C} \rightarrow \mathrm{P}, \mathrm{D} \rightarrow \mathrm{S}$

(2) $\mathrm{A} \rightarrow \mathrm{R}, \mathrm{B} \rightarrow \mathrm{Q}, \mathrm{C} \rightarrow \mathrm{S}, \mathrm{D} \rightarrow \mathrm{P}$

(3) $\mathrm{A} \rightarrow \mathrm{R}, \mathrm{B} \rightarrow \mathrm{S}, \mathrm{C} \rightarrow \mathrm{Q}, \mathrm{D} \rightarrow \mathrm{P}$

(4) $\mathrm{A} \rightarrow \mathrm{S}, \mathrm{B} \rightarrow \mathrm{R}, \mathrm{C} \rightarrow \mathrm{Q}, \mathrm{D} \rightarrow \mathrm{P}$

Q12

A particle is moving on X-axis has potential energy $U = 2 - 20x + 5x^2$ J along X-axis. The particle is released at $x = -3$. The maximum value of x will be (x is in metre and U is in joules)

(1) 5 m

(2) $3m$

(3) 7 m

(4) 9 m

Q13

In a double-slit experiment, the distance between slits is increased 10 times, whereas their distance from screen is halved, then the fringe width

(1) Becomes $\frac{1}{20}$th

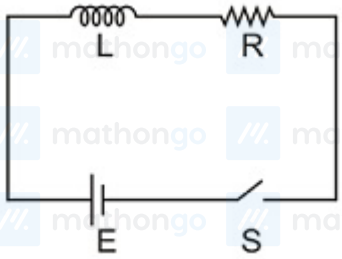
(2) Becomes $\frac{1}{90}$th

(3) Remains same

(4) Becomes $\frac{1}{10}$th

Q14

In the circuit shown in diagram, switch S is closed at time $t = 0$. The charge which passes through the battery in one time constant is



(1) $\frac{eR^2E}{L}$

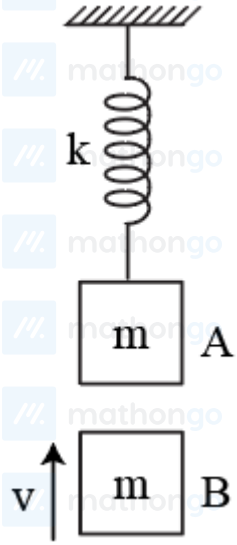
(2) $\frac{EL}{R}$

(3) $\frac{EL}{eR^2}$

(4) $\frac{eL}{ER}$

Q15

Block ' A ' is hanging from a vertical spring and is at rest. Block ' B ' strikes the block ' A ' with velocity ' v ' and sticks to it. Then the value of ' v ' for which the spring just attains natural length is -



(1) $\sqrt{\frac{60mg^2}{k}}$

(2) $\sqrt{\frac{6mg^2}{k}}$

(3) $\sqrt{\frac{10mg^2}{k}}$

(4) None of these

Q16

A ball rolls off the top of stair-way with a horizontal velocity of magnitude $1.8\ \text{m s}^{-1}$. The steps are $0.20\ \text{m}$ high and $0.20\ \text{m}$ wide. Which step will the ball hit first?

(1) First

(2) Second

(3) Third

(4) Fourth

Q17

The distance moved by the screw of a screw gauge is 2 mm in four rotations and there are 50 divisions on its cap. When nothing is put between its jaws, 30^{th} division of circular scale coincides with the reference line, with zero of circular scale lying above the reference line. When a plate is placed between the jaws, the main scale reads 2 divisions and the circular scale reads 20 divisions. The thickness of the plate is

(1) 1.5 mm

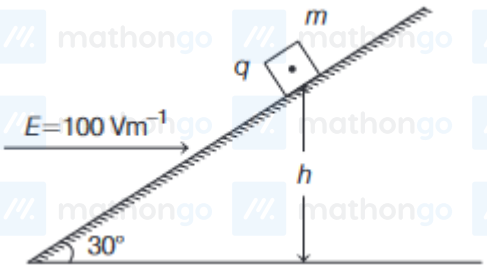
(2) 1.2 mm

(3) 1.4 mm

(4) 1.6 mm

Q18

An inclined plane making an angle 30° with the horizontal is placed in a uniform horizontal electric field of 100Vm^{-1} as shown in the figure. A small block of mass 1kg and charge, 0.01C is allowed to slide down from rest from a height, $h = 1\ \text{m}$. If the coefficient of friction is 0.2 , then the acceleration of the block is nearly, (Acceleration due to gravity, $g = 10\ \text{ms}^{-2}$)



(1) $1.4\ \text{ms}^{-2}$

(2) $2.4\ \text{ms}^{-2}$

(3) $3.4\ \text{ms}^{-2}$

(4) $4.4\ \text{ms}^{-2}$

Q19

A gas mixture consists of 2 moles of oxygen and 4 moles of argon at temperature T. Neglecting all vibrational modes we calculated the total internal energy of the system to be xRT. What is the value of x?

(1) 10

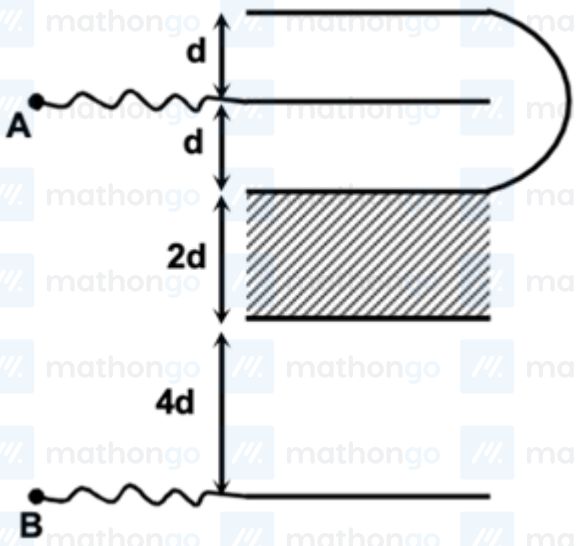
(2) 9

(3) 13

(4) 11

Q20

In the arrangement shown, a dielectric slab of dielectric constant $k = 2$ is completely filled in the shaded region. All the plates have same area S. Find the equivalent capacitance between A and B. (Given $\frac{\varepsilon_0 S}{d} = 1\mu F$)



(1) $\frac{2}{11}\mu$f

(2) $\frac{4}{11}\mu f$

(3) $\frac{7}{22}\mu$f

(4) $\frac{9}{22}\mu$f

Q21

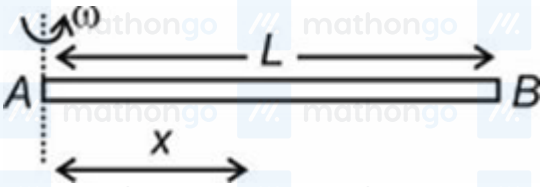
An unknown resistance R_1 is connected in series with a resistance of 10 Ω. This combination is connected to one gap of the meter bridge while a resistance R_2 is connected in the other gap. The balance point is at 50 cm, Now, when the 10 Ω resistance is removed the balance point shifts to 40 cm. The value of R_1(in ohm) is

Q22

A hydrogen-like atom (atomic number Z) is in a higher excited state of quantum number n. This excited atom can make a transition to the first excited state by successively emitting two photons of energies 10.20 eV and 17.00 eV respectively. Alternatively, the atom from the same excited state can make a transition to the second excited state by successively emitting two photons of energy 4.25 eV and 5.95 eV respectively. Determine the value of Z. [Ionization energy of hydrogen atom $= 13.6$ eV]

Q23

A non-conducting rod of length L with linear charge density $\lambda = \lambda_0 x$ where x is the distance from end A is rotating with constant angular speed ω about the same end. If the angular velocity of the rod (ω) is large, then the magnetic dipole moment of the system is $\frac{\omega\lambda_0 L^4}{n}$. What is the value of n?

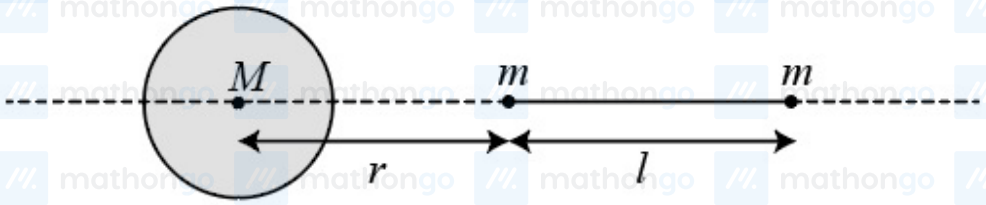


Q24

Two persons A and B are located in $X-Y$ plane at the points $(0, 0)$ and $(0, 10)$ respectively. (The distances are measured in MKS unit). At a time $t = 0$, they start moving simultaneously with velocities $\vec{v}_A = 2j\text{ms}^{-1}$ and $\vec{v}_B = 2\hat{i}\text{ms}^{-1}$ respectively. The time after which A and B are at their closest distance is t sec, find $2t$.

Q25

A large sphere of mass M is fixed at one position and two identical particles each of mass m are kept on a line passing through the centre of M (see figure). The point masses are connected by a rigid massless rod of length l and this assembly is free to move along the line connecting them. All three masses interact only through their mutual gravitational interaction. When the point mass nearer to M is at a distance $r = 3$l from M, the tension in the rod is zero for $m = k\left(\frac{M}{288}\right)$. The value of k is



Q26

List I contain pair of solute and solvent and List II contain properties of their resulting solution.

	List-I		List-II
(P)	n-hexane + n − heptane	(1)	$\Delta H_{\text{mixing}} = 0$
(Q)	CS_2 + Acetone	(2)	$\Delta H_{\text{mixing}} \neq 0$
(R)	$CHCl_3$ + Acetone	(3)	Minimum boiling azeotrope can be formed
(S)	Benzene + toluene	(4)	Maximum boiling azeotrope can be formed
		(5)	$P_S = P_A^\circ X_A + P_B^\circ X_B$ $P_S \rightarrow$ vapour pressure of solution $P_A^\circ \rightarrow$ vapour pressure of pure solute $P_B^\circ \rightarrow$ vapour pressure of pure solvent $X_A \rightarrow$ mole fraction of solute $X_B \rightarrow$ mole fraction of solvent

(1) $P \rightarrow 1,5; Q \rightarrow 2,3; R \rightarrow 2,5; S \rightarrow 2,3$

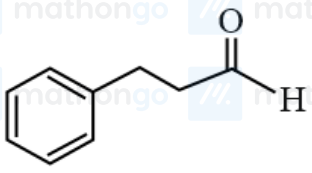
(2) $P \rightarrow 2,4; Q \rightarrow 2,3; R \rightarrow 2,5; S \rightarrow 2,4$

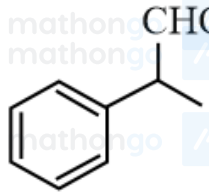
(3) $P \rightarrow 2,3; Q \rightarrow 1,5; R \rightarrow 4,5; S \rightarrow 1,5$

(4) $P \rightarrow 1,5; Q \rightarrow 2,3; R \rightarrow 2,4; S \rightarrow 1,5$

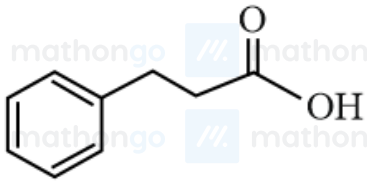
Q27

In the presence of peroxide, styrene reacts with HBr to give X. When X reacted with magnesium in dry ether followed by CO_2 and hydrolysis gave Y. Treatment of Y with PCl_5 and then next with $H_2, Pd - BaSO_4$ gave Z. What is Z?

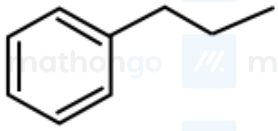
(1) 



(2)



(3)



(4)

Q28

pH of aqueous solution of one of the following salts is independent of its concentration. The salt is:

(1) CH_3COONa

(2) $C_6H_5NH_3Cl$

(3) $PbCl_2$

(4) CH_3COONH_4

Q29

Which of the following is not correct?

(1) $FeCl_3 + KCNS \longrightarrow$ Red colour

(2) $KI + PbCl_2 \longrightarrow$ Yellow ppt.

(3) NH_4Cl+ Nesseler 's reagent $\longrightarrow$ Blue colour

(4) $DMG + Ni^{2+} + NH_4OH \longrightarrow$ Scarlet red ppt.

Q30

He^+ ions in its ground state are irradiated with photons of energy $67.15eV$. Electrons ejected from He^+ strikes the H-atom in its ground state. Give the maximum number of spectral lines which can be obtained from de-excitation of H-atoms.

(1) 12

(2) 4

(3) 8

(4) 6

Q31

Given the electronic configurations of few elements. Select the incorrect Match:

1	$1s^2 2s^2 2p^5$	Most electronegative element in the periodic table
2	$1s^2 2s^2 2p^3$	An element belonging to 3^{rd} period and 5^{th} group
3	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$	A d-block element
4	$1s^2 2s^2 2p^6 3s^2 3p^6$	An element from 18^{th} group

(1) 1 and 4 only

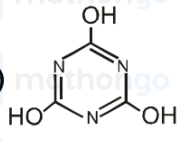
(2) 2 only

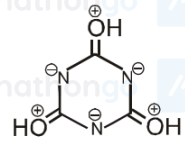
(3) 1, 2 and 3

(4) All are the incorrect matches.

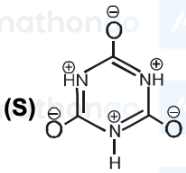
Q32

The correct statement(s) concerning the structures $P, Q, R \& S$ is/are :

(P) 

(Q) 

(R) 

(S) 

A - Q & S are tautomers.

B - R & S are resonating structures.

C - P & R are tautomers.

D - P & Q are resonating structures.

(1) A,B,C Only

(2) A,B,C,D

(3) A,B Only

(4) C,D Only

Q33

A Complex P of composition $\mathrm{Cr(H_2O)_6Br_n}$ has a spin only magnetic moment of 3.83 BM. It reacts with $\mathrm{AgNO_3}$ and shows geometrical isomerism. The IUPAC nomenclature of P is

(1) Hexaaqua chromium (III) bromide

(2) Dibromidotetraaqua chromium (IV) bromide dihydrate

(3) Tetraaquadibromido chromium (IV) bromide dihydrate

(4) Tetraaquadibromido chromium (III) bromide dihydrate

Q34

The correct order of reagents required to bring the following change is:

(1) $\mathrm{H_3O^+; KCN; NBS; K_2Cr_2O_7/H^+}$

(2) $\mathrm{K_2Cr_2O_7/H^+; Cl_2/KOH; CH_3MgBr; H_3O^+}$

(3) conc. $\mathrm{H_2SO_4; NBS; KCN; H_3O^+}$

(4) Conc. $\mathrm{H_2SO_4; NBS; CH_3MgBr; K_2Cr_2O_7/H^+}$

Q35

Arrange $\mathrm{Yb^{+3}}$, $\mathrm{Ce^{+3}, La^{+3}, Pm^{+3}}$ ions in increasing order of their ionic radii

(1) $\mathrm{Ce^{+3} < Yb^{+3} < Pm^{+3} < La^{+3}}$

(2) $\mathrm{Yb^{+3} < Pm^{+3} < La^{+3} < Ce^{+3}}$

(3) $\mathrm{Yb^{+3} < Pm^{+3} < Ce^{+3} < La^{+3}}$

(4) $\mathrm{Pm^{+3} < La^{+3} < Ce^{+3} < Yb^{+3}}$

Q36

For reactions $\mathrm{A \rightarrow B}$ and $\mathrm{P \rightarrow Q}$ Arrhenius constants are 10^8 and 10^{10} respectively. If $\mathrm{E_{A \rightarrow B} = 600\ cal/mole}$ and $\mathrm{E_{P \rightarrow Q} = 1200\ cal/mole}$, then find the temperature at which their rate constants are same.

(Given: $R = 2$ cal/mole/K)

(1) 600 K

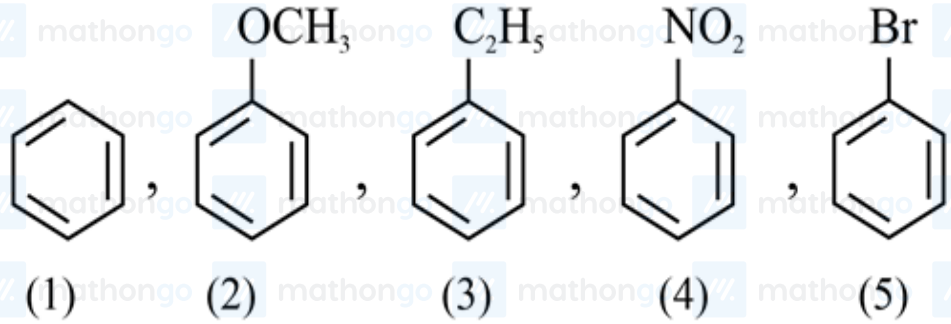
(2) 300×4.606 K

(3) $\frac{300}{4.606}$K

(4) $\frac{4.606}{600}$K

Q37

Give the order of decreasing reactivity towards an electrophile.



(1) $2 > 3 > 1 > 5 > 4$

(2) $3 > 1 > 2 > 5 > 4$

(3) $5 > 4 > 2 > 3 > 1$

(4) $1 > 5 > 2 > 3 > 4$

Q38

Among the following which one will have the largest O − O bond length?

(1) KO_2

(2) O_2

(3) $O_2^+[AsF_6]^-$

(4) K_2O_2

Q39

In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1M H_2SO_4. The percentage of nitrogen in the soil is

(1) 37.33

(2) 43.33

(3) 45.33

(4) 35.33

Q40

A Buffer solution having pH 4.72 is prepared by mixing of 1 M NaOH and 1 M HCN . What is the ratio of volume of acid to base? $\left(pk_b \text{ of } CN^- = 9.28\right)$

(1) 1 : 1

(2) 1 : 2

(3) 2 : 1

(4) 3 : 1

Q41

Assertion (A): The denaturation of proteins can destroy all $1^\circ, 2^\circ$ and 3° protein structures.

Reason (R): Curdling of milk is due to denaturation of proteins.

The correct option among the following is

(1) (A) is true, (R) is true and (R) is the correct explanation for (A)

(2) (A) is true, (R) is true but (R) is not the correct explanation for (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

Q42

All the elements of Group 15 form hydrides of the type EH_3. From the following given statements with respect to EH_3 , select the incorrect one.

(1) Basicity as well as reducing strength is maximum for NH_3

(2) Standard enthalpy of formation is negative only for NH_3 while for others it is positive

(3) HEH bond angle follows the order:
$NH_3 > PH_3 > AsH_3 > SbH_3$

(4) Boiling point follows the order:
$PH_3 < AsH_3 < NH_3 < SbH_3$

Q43

It is an experimental fact that $\mathrm{dmg} + \mathrm{Ni(II)}$ salt $+\mathrm{NH_4OH} \longrightarrow$ Red ppt Which of the following is wrong about this Red ppt.?

(1) It is non-ionic compound

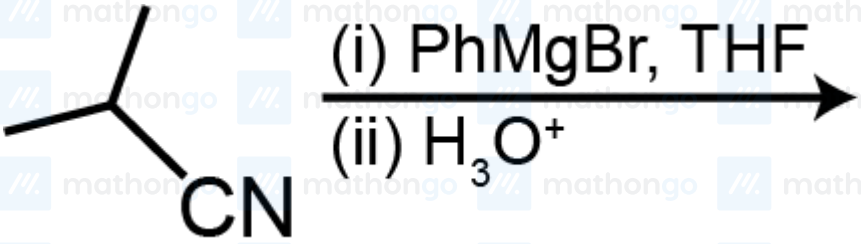
(2) It involves intra molecular H-bonding

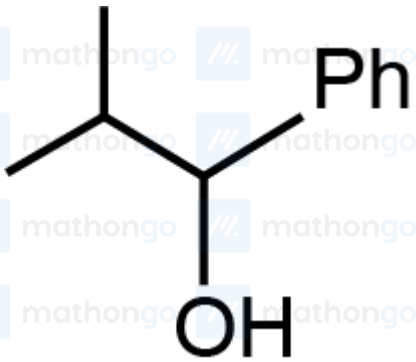
(3) $\mathrm{Ni(II)}$ is $\mathrm{sp^3}$ hybridised

(4) It is a diamagnetic complex

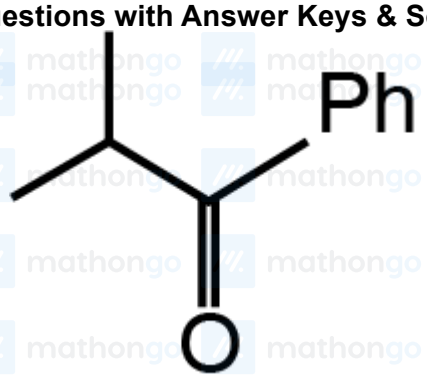
Q44

For the reaction below the structure of the product Q is

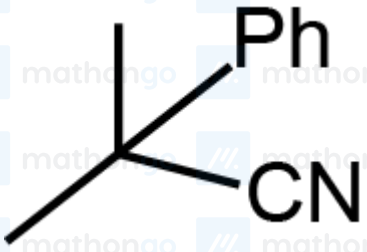




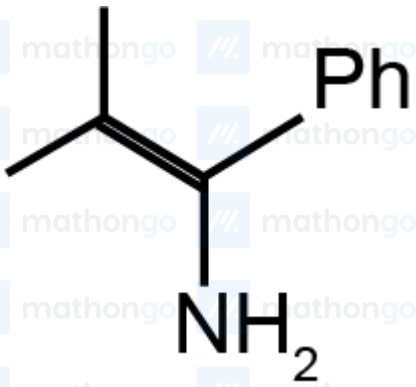
(1)



(2)



(3)



(4)

Q45

6 mol of a mixture of Mohr's salt and $Fe_2(SO_4)_3$ requires 500 ml of 1 M of $K_2Cr_2O_7$ for complete oxidation in acidic medium. The mole % of the Mohr's salt in the mixture is

(1) 75

(2) 50

(3) 60

(4) 25

Q46

In how many of the following species the central atoms have two lone pairs of electrons?

XeF_4 XeF_5^- F_2SeO_2

XeF_3^+ $XeOF_4$ $ClOF_3$

ICl_4^- SCl_2 OSF_4

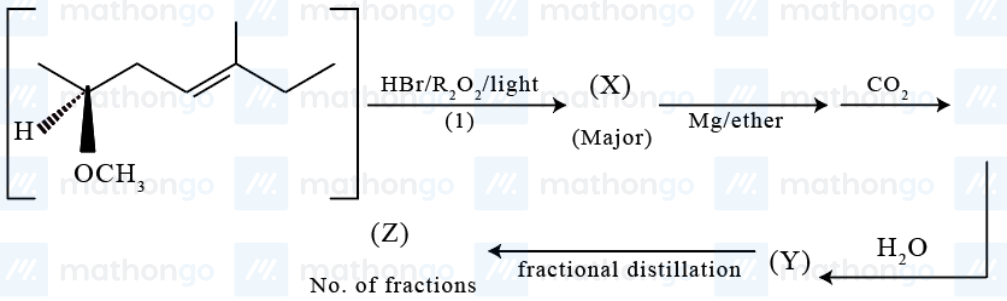
Q47

The work done in an open vessel at $300\ K$, when $112\ g$ iron reacts with dilute HCl to give $FeCl_2$, is nearly W, find 5W. Mark answer in calories.

Q48

A 1 L solution of $CuSO_4$ was electrolysed till the pH of the solution become 1. A current of 0.965 A was passed through the solution for $x \times 10^y$sec with an efficiency of 20%. Report the value of $25y/x$ (x and y are smallest integers)

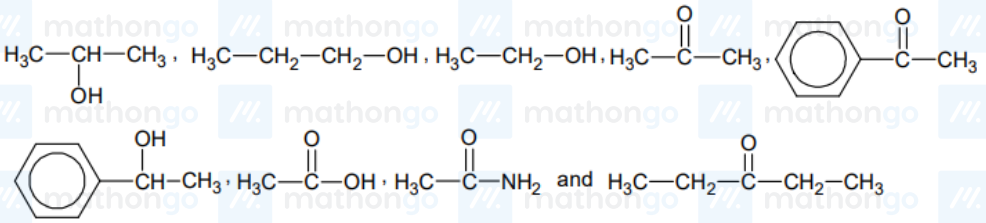
Q49



Find the value of (Z).

Q50

Among the following the total number of compounds which give positive iodoform test is/are:



Q51

The mean and variance of 20 observations are found to be 10 and 4 respectively. On rechecking, it was found that an observation 8 is incorrect. If the wrong observation is omitted, then the correct variance is

(1) 7

(2) $\frac{100}{19}$

(3) $\frac{1400}{361}$

(4) $\frac{1440}{361}$

Q52

The solution of differential equation $\left(2xy^4e^y+2xy^3+y\right)dx+\left(x^2y^4e^y-x^2y^2-3x\right)dy=0$ is

(1) $x^2e^y+\frac{x^2}{y}+\frac{x}{y^3}=c$

(2) $x^2e^y-\frac{x^2}{y}+\frac{x}{y^3}=c$

(3) $x^2e^y+\frac{x^2}{y}-\frac{x}{y^3}=c$

(4) $x^2e^y-\frac{x^2}{y}-\frac{x}{y^3}=c$

Q53

Consider the real valued function $h:\{0,1,2.....100\}\to R$ such that $h(0)=5, h(100)=20$ and satisfying $h(p)=\frac{1}{2}\{h(p+1)+h(p-1)\}$ for every $p=1,2....99$. Then the value of $h(1)$ is

(1) 5.15

(2) 5.5

(3) 6

(4) 6.15

Q54

If α and β are roots of $x^2-x+2=0$ and $S_n=\alpha^n+\beta^n, n\in N$, then value of $\frac{\sum_{n=1}^{5}S_n}{\sum_{n=1}^{4}\alpha^n+\sum_{n=1}^{4}\beta^n+7}$ is

(1) 5

(2) 6

(3) 2.5

(4) 3

Q55

If $A=\begin{bmatrix} a & x & y \\ x & b & z \\ y & z & c \end{bmatrix}$, where $a,b,c,x,y,z \in \{1,2,3,4,5,6\}$ and a,b,c,x,y,z are distinct, then number of matrices in A with trace equal to 10 are: (where trace represents the sum of diagonal elements of a square matrix)

(1) 108

(2) 72

(3) 36

(4) 216

Q56

The area of the region bounded by the curves $y=9x^2$ and $y=5x^2+4$ (in sq units) is $\frac{K}{3}$, find K.

(1) 19

(2) 16

(3) 18

(4) 17

Q57

Suppose families always have one, two or three children, with probabilities $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{1}{4}$ respectively. Assume everyone eventually gets married and has children, the probability of a couple having exactly four grandchildren is

(1) $\frac{27}{128}$

(2) $\frac{37}{128}$

(3) $\frac{25}{128}$

(4) $\frac{20}{128}$

Q58

$\vec{a}=3\hat{i}+\hat{j}-\hat{k}, \vec{b}=\hat{i}-4\hat{j}+5\hat{k}, \vec{c}=4\hat{i}+5\hat{j}-\hat{k}$ are three vectors and a vector $\vec{r}$ is perpendicular to both the vectors $\vec{b}$ and $\vec{c}$. If $\vec{r}\cdot\vec{a}=9$, then $\vec{r}=$

(1) $3(\hat{i}-\hat{j}-\hat{k})$

(2) $3(\hat{i}-\hat{j}+\hat{k})$

(3) $9(\hat{i}-\hat{j}-\hat{k})$

(4) $9(\hat{i}-\hat{j}+\hat{k})$

Q59

Let the solution of the equation $\frac{dy}{dx}=y+\int_0^2 ydx$ is $y(x)$. If $y(0)=1$, then $y(2)=$

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

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

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

(4) $\frac{e^2-2}{4-e^2}$

Q60

Let $f(x)=\begin{cases}4x-x^3+\ell n\left(b^2-3b+3\right), & 2\leq x<3\\ x-18 & x\geq 3\end{cases}$. Find all the possible real values of b such that $f(x)$ has the smallest value at $x=3$.

(1) $(-\infty,2]\cup[3,\infty)$

(2) $(-\infty,1]\cup[2,\infty)$

(3) $(1,2]$

(4) $(-\infty,2]$

Q61

If $\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{2}{3x}\right)+\tan^{-1}\left(\frac{3}{4}\right)=\frac{\pi}{2}$, then the value of $\tan\left(\pi-2\tan^{-1}x\right)$ is :

(1) $\frac{24}{7}$

(2) $\frac{7}{24}$

(3) $\frac{25}{7}$

(4) $\frac{7}{25}$

Q62

If z be a complex number satisfying $|z|^2 + 2(z + \bar{z}) - 5 = 0$, then complex number $z + 3 + 2i$ will lie on $(i = \sqrt{-1})$

(1) Circle with centre $1 - 2i$ and radius 4

(2) Circle with centre $1 + 2i$ and radius 4

(3) Circle with centre $1 + 2i$ and radius 3

(4) Circle with centre $1 - 2i$ and radius 3

Q63

Equation of the line of shortest distance between the lines $\frac{x}{2} = \frac{y}{-3} = \frac{z}{1}$ and $\frac{x-2}{3} = \frac{y-1}{-5} = \frac{z+2}{2}$ is -

(1) $3(x - 21) = (3y - 92) = (3z - 32)$

(2) $3x - 62 = 3y - 93 = 3z + 31$

(3) $\frac{(x-21)}{3} = \frac{\left(y+\frac{92}{3}\right)}{3} = \frac{\left(z-\frac{32}{3}\right)}{3}$

(4) $x - \frac{62}{3} = y + 31 = \left(z + \frac{31}{3}\right)$

Q64

If system of equations
$x + (\sin\alpha)y + \left(\sin^2\alpha\right)z = 0$
$x + (\cos\alpha)y + \left(\cos^2\alpha\right)z = 0$
$x + (\sin 2\alpha)y + \left(\sin^2 2\alpha\right)z = 0$
has non trivial solutions, then number of distinct values of α (where $\alpha \in [0, \pi]$), is

(1) 9

(2) 6

(3) 8

(4) 7

Q65

O is the vertex of the parabola $y^2 = 4ax$ and L is the upper end of the latus rectum. If LH is drawn perpendicular to OL meeting OX in H, then the length of the double ordinate through H is

(1) $4\sqrt{5}$

(2) $4\sqrt{5}\,a$

(3) $3\sqrt{5}\,a$

(4) $2\sqrt{5}\,a$

Q66

The direction cosines of two lines are given by $2\ell + \lambda m + n = 0$ and $mn + n\ell - 5\ell m = 0$. Find value of λ, if the lines are perpendicular.

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

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

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

(4) None of these

Q67

If $f(x)$ be a function such that $f(x+1) = \frac{f(x)-1}{f(x)+1}, \forall x \in N$ and $f(1) = 2$ then $f(999)$ is -

(1) -3

(2) 2

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

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

Q68

Let $f(x) = \lim_{n\to\infty} \tan^{-1}\left\{4n^2\left(1-\cos\frac{x}{n}\right)\right\}$ and $g(x) = \lim_{n\to\infty} \frac{n^2}{2}\ln\cos\left(\frac{2x}{n}\right)$, then $\lim_{x\to 0} \frac{f(x)+2g(x)}{x^6} =$

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

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

(3) $\frac{8}{3}$

(4) $-\frac{8}{3}$

Q69

If $\int \frac{x^{pq-p-1}}{(x^p+1)^q}\,dx = \frac{2\left(1+x^{-p}\right)^{1-q}}{\lambda p(q-1)} + c\ (p, q \in N - \{1\})$, then the value of λ is (here, c is an arbitrary constant)

(1) 3

(2) 4

(3) 2

(4) 6

Q70

Consider $\triangle ABC$ whose vertices are $A \equiv (m, n), B \equiv (1, 2), C \equiv (2, 3)$ and vertex 'A' lies on the line $2x - y + 3 = 0$, where $m, n \in N$ with $m + n > 10$. Let area of $\triangle ABC$ be S such that $[S] = 2$, where $[x]$ denotes greatest integer less than or equal to x. If the equation of side AC of ΔABC is $ax + by = 9$, then $(a + b)$ equals

(1) 4

(2) 15

(3) 5

(4) 11

Q71

If number of arrangements of letters of the word "DHARAMSHALA" taken all at a time so that no two alike letters appear together is $\left(4^a.5^b \cdot 6^c \cdot 7^d\right)$, (where $a, b, c, d \in N$), then $a + b + c + d$ is equal to

Q72

Let $\vec{x} = \hat{i} + 3\hat{j} - 2\hat{k}, \vec{y} = 2\hat{i} + 4\hat{j} + \hat{k}$ and a vector $\vec{z}$ satisfying $\vec{x} \times \vec{z} = \vec{x} \times \vec{y}$ and $\vec{z} \cdot \vec{x} = 0$. Then $[|\vec{z}|]$ is, (where [.] denotes greatest integer function)

Q73

The number of points where $f(x) = |x + [x]| - 3[2x] + 4[3x]$ is discontinuous in $[-1, 1]$, is:
[Note: $[k]$ denotes greatest integer less than or equal to k.]

Q74

The coefficient of x^4 appearing in the expansion of $\left(1+x^2\right)^{10}(1-x)^6\left(1+x^3\right)^8(1+x)^6$ is

Q75

If $\lim_{n\to\infty}\int_{\frac{-1}{\sqrt[3]{n}}}^{\frac{1}{\sqrt[3]{n}}} x\ln\left(1+e^x+e^{2x}+e^{3x}+\ldots\ldots e^{2nx}\right)dx=\prod_{k=2}^{m}\left(1-\frac{1}{k^2}\right)$ then find the value of m.