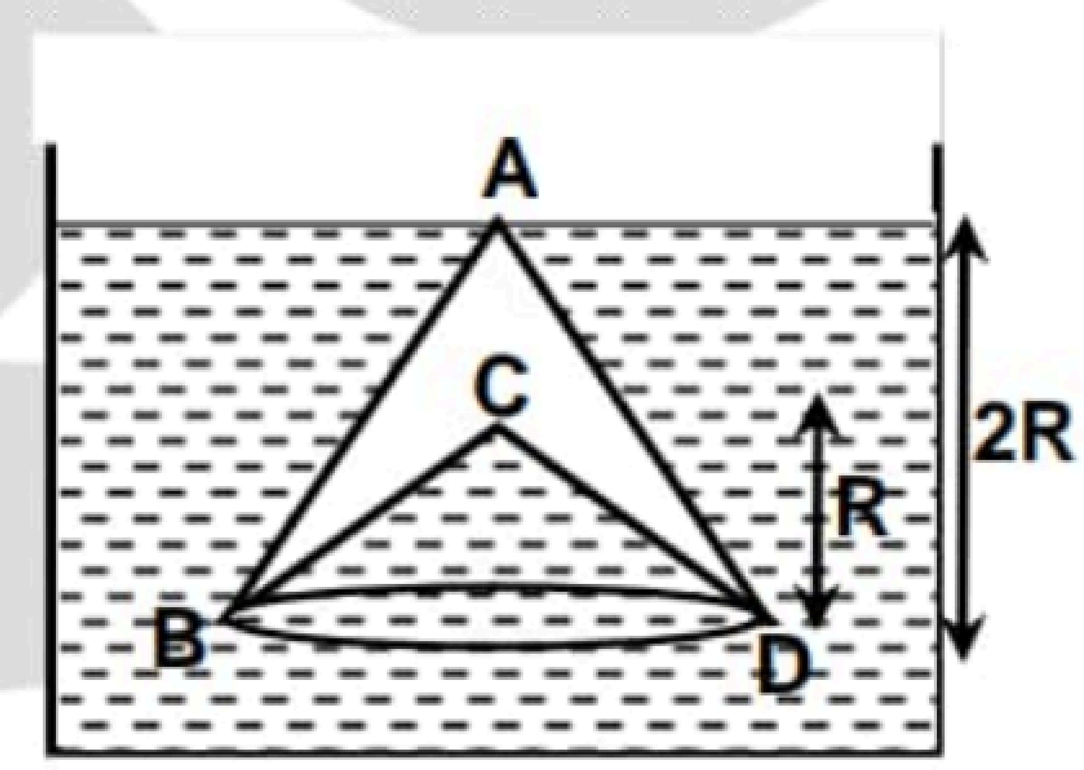
Two rods of different materials having coefficient of thermal expansion α_1, α_2 and Young's modulus Y_1, Y_2 respectively are fixed separately between two rigid massive walls. The rods are heated such that they undergo the same increase in temperatures. There is no bending of the rods. If $\alpha_1 : \alpha_2 = 2 : 3$, then thermal stress developed in the two rods are equal provided $Y_1 : Y_2$ is equal to

(A) 2 : 3
(B) 1 : 1
(C) 3 : 2
(D) 4 : 9

A solid cone of uniform density and height 2R and the base radius R has a conical portion scooped out from its base with the same base radius but height R as shown in the figure. The solid cone is floating in a liquid of density ρ with vertex A touching the fluids surface. If atmospheric pressure is P_0, the force acting on the surface BCD due to liquid is



(A) $\frac{\pi R^3 \rho g}{3}\left(2+\frac{2P_0}{R\rho g}\right)$

(B) $\frac{\pi R^3 \rho g}{3}\left[5+\frac{3P_0}{R\rho g}\right]$

(C) $\frac{\pi R^3 \rho g}{3}\left[1+\frac{3P_0}{R\rho g}\right]$

(D) $\frac{\pi R^3 \rho g}{3}\left[4+\frac{3P_0}{R\rho g}\right]$

Two particles are in SHM in a straight line about same equilibrium position. Amplitude A and time period T of both the particles are equal. At time $t = 0$, one particle is at displacement $y_1 = +A$ and the other at $y_2 = -\frac{A}{2}$ and they are approaching towards each other. The time after which they cross-each other will be

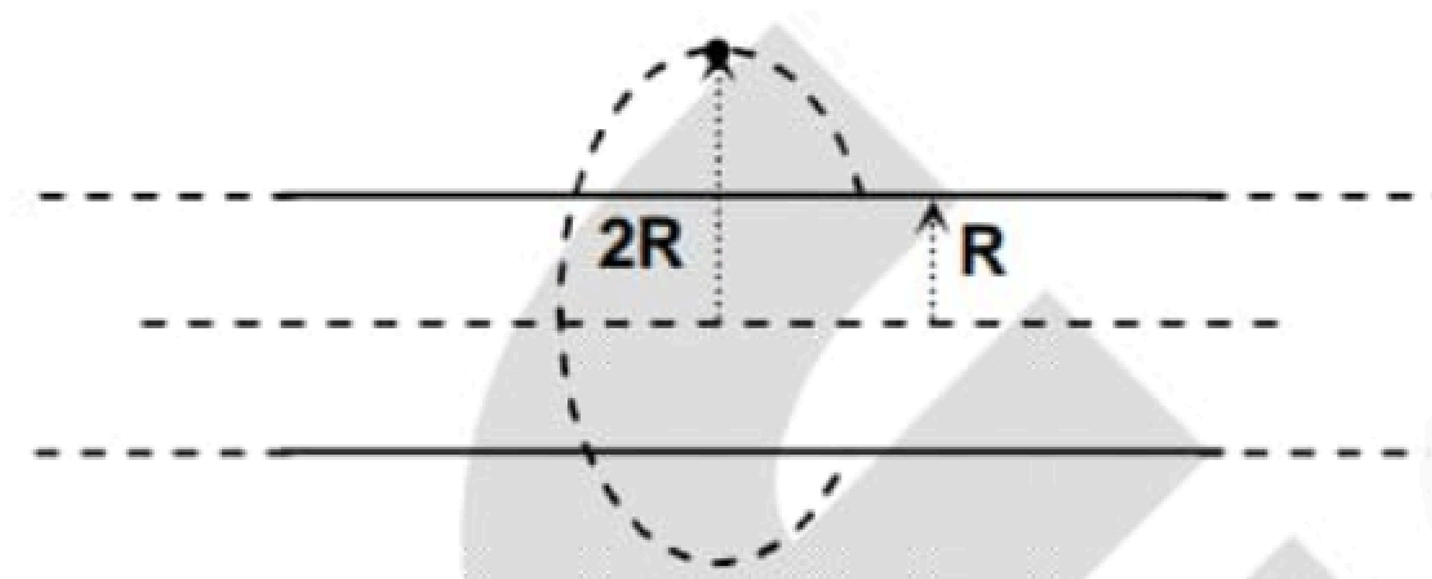
(A) $\frac{T}{3}$

(B) $\frac{T}{4}$

(C) $\frac{5T}{6}$

(D) $\frac{T}{5}$

Consider a long hypothetical cylindrical planet of radius R and uniform volume density ρ. If a satellite revolves around the planet in circular orbit of radius 2R in a plane perpendicular to the axis of the planet, find the orbital speed of the satellite. (G is gravitational constant)



(A) $R\sqrt{2G\rho}$

(B) $R\sqrt{3G\pi\rho}$

(C) $R\sqrt{2\pi G\rho}$

(D) $R\sqrt{G\pi\rho}$

Wave equation given by

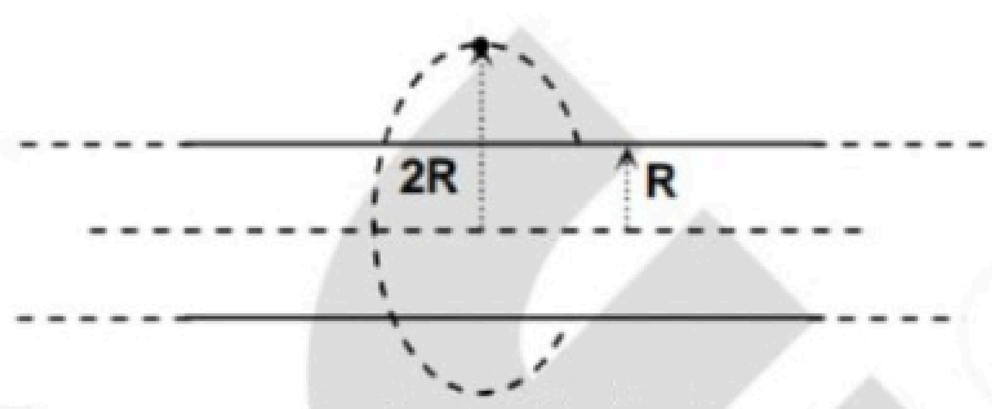
$$y = 0.02\cos\left(\frac{\pi}{2} + 50\pi t\right)\cos 10\pi x$$

Here, x,y are in meters and t is in second. Choose wrong statement:

(A) Antinode occurs at x = 0.3 m
(B) The wavelength is 0.2 m
(C) The speed of constituent waves in 4 m/s
(D) Node occurs at x = 0.15 m

Physics - Question 1

Consider a long hypothetical cylindrical planet of radius R and uniform volume density ρ. If a satellite revolves around the planet in circular orbit of radius 2R in a plane perpendicular to the axis of the planet, find the orbital speed of the satellite. (G is gravitational constant)



(A) $R\sqrt{2G\rho}$ (B) $R\sqrt{3G\pi\rho}$

(C) $R\sqrt{2\pi G\rho}$ (D) $R\sqrt{G\pi\rho}$

- A
- B
- C
- D

An upright open U-tube which can contain 0.5 m mercury in each limb has its limbs 20 cm. apart. This is used as an accelerometer in a horizontal flight. From this device acceleration that can be measured are

(A) 13 m/sec^2
(B) 12 m/sec^2
(C) 24 m/sec^2
(D) 20 m/sec^2

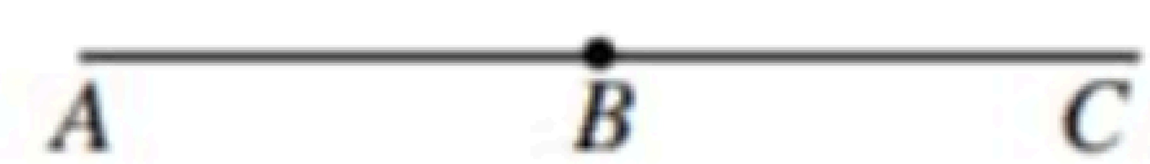
An ideal monatomic gas undergoes different types of processes which are described in List–I. Match the corresponding effects in List–II. The letters have their usual meanings.

List–I		List–II	
(P)	$P = 2V^2$	(1)	If volume increases then temperature will also increase
(Q)	PV^2 = constant	(2)	If volume increases then temperature decreases
(R)	$C = C_v + 2R$	(3)	For expansion, heat will have to be supplied to the gas
(S)	$C = C_v - 2R$	(4)	If temperature increases then work done by gas is positive

(A) P – 1, 3, 4; Q – 2; R – 3; S – 4
(B) P – 1, Q – 2, R – 4, S – 3
(C) P – 3, 2, Q – 3, R – 4, S – 3
(D) P – 3, 4, Q – 2, R – 4, S – 3

A ball of density d is dropped in the liquid of density $2d$ from height 20m. Find time period of motion (neglect viscosity).

A long wire *ABC* is made by joining two wires *AB* and *BC* of equal area of cross section. *AB* has length 4.8 m and mass 0.12 kg while *BC* has length 2.56 m and mass 0.4 kg. The wire is under a tension of 160 N. A wave Y (in cm) = 3.5 sin $(kx - wt)$ is sent along *ABC* from end *A*. No power is dissipated during propagation of wave.



List –I		List-II
(P)	Amplitude of reflected wave	(1). 2.0
(Q)	Amplitude of transmitted wave	(2). 1.5
(R)	Maximum displacement of antinodes in the wire *AB*	(3). 5
(S)	Percentage fraction of power transmitted in the wire *BC*	(4). 82
		(5). 92

(A) P – 1, Q – 2, R – 3, S – 4
(B) P – 2, Q – 1, R – 4, S – 3
(C) P – 2, Q – 1, R – 3, S – 4
(D) P – 1, Q – 2, R – 4, S – 3

End A of a rod *AB* of length $L = 0.5$ m and of uniform cross-sectional area is maintained at some constant temperature. The heat conductivity of the rod is $K = 17\ J/S - m°k$. The other end *B* of this rod is radiating energy into vacuum and the wavelength with maximum energy density emitted from this end is $\lambda_0 = 75000A°$. If the emissivity of the end *B* is *e* = 1, determine the temperature of the end *A*. Assuming that except the ends the rod is thermally insulated.

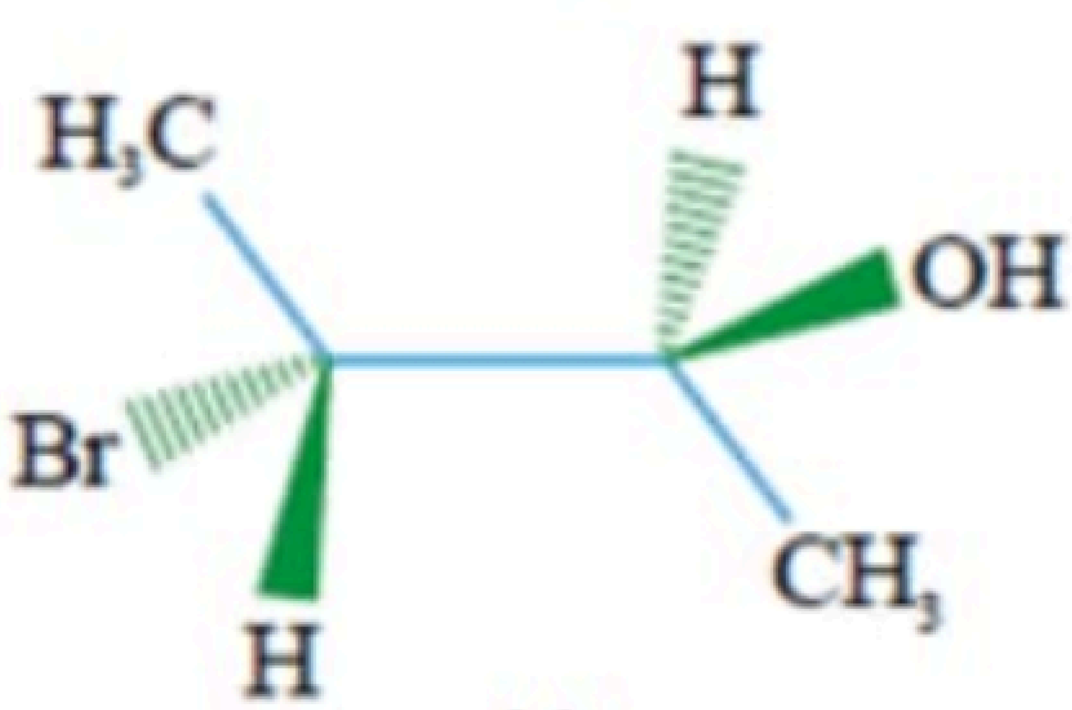
$B_3N_3H_6$ + solution of hydrochloric acid $\rightarrow$?
Select correct about above reaction
(A) No reaction
(B) $B_3N_3H_6$ show substitution reaction and produce $B_3N_3Cl_6$
(C) $B_3N_3H_6$ show additon reaction and produce $B_3N_3H_9Cl_3$ in which Cl is bonded to boron
(D) $B_3N_3H_6$ show additon reaction and produce $B_3N_3H_9Cl_3$ in which Cl is bonded to nitrogen

It is known that temperature in a room is 20°C when outdoor temperature is –20°C and 10°C when the outdoor temperature is –40°C. Determine the temperature of the radiator heating the room.

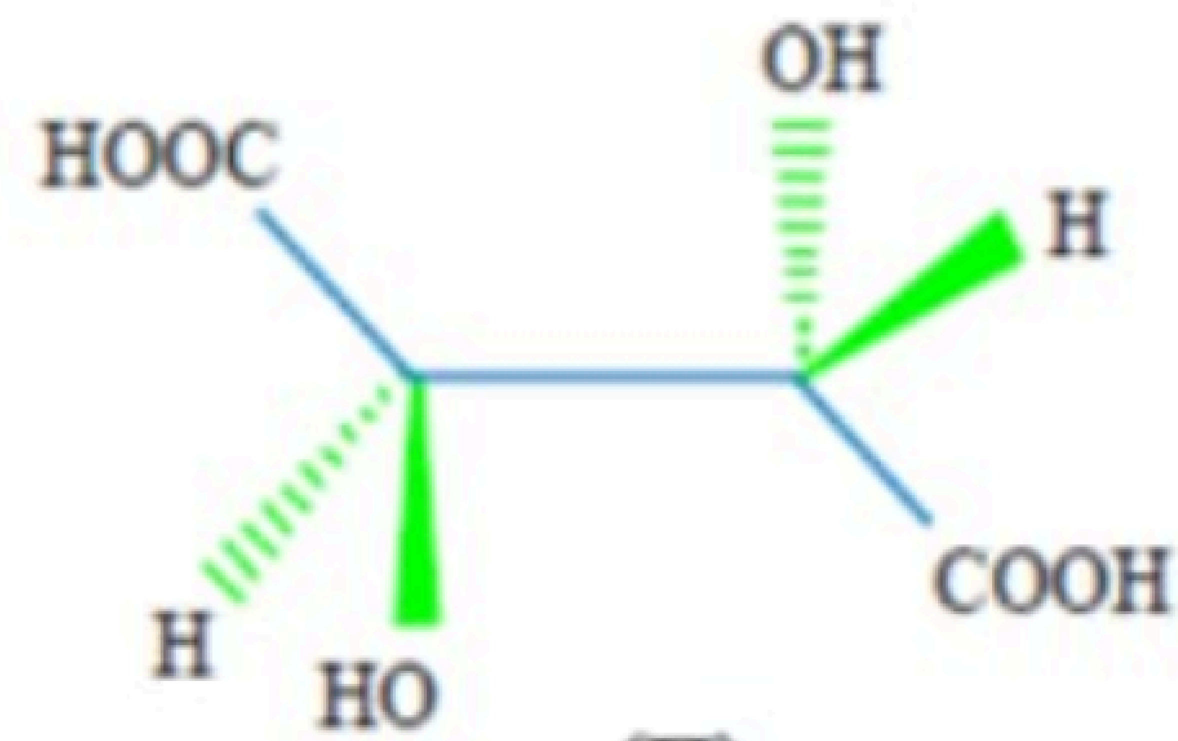
The silicate anion in the mineral kinoite is a chain of three 4 SiO tetrahedron, that share corners with adjacent tetrahedra. The charge of the silicate anion is:

(A) -8
(B) -4
(C) -6
(D) -2

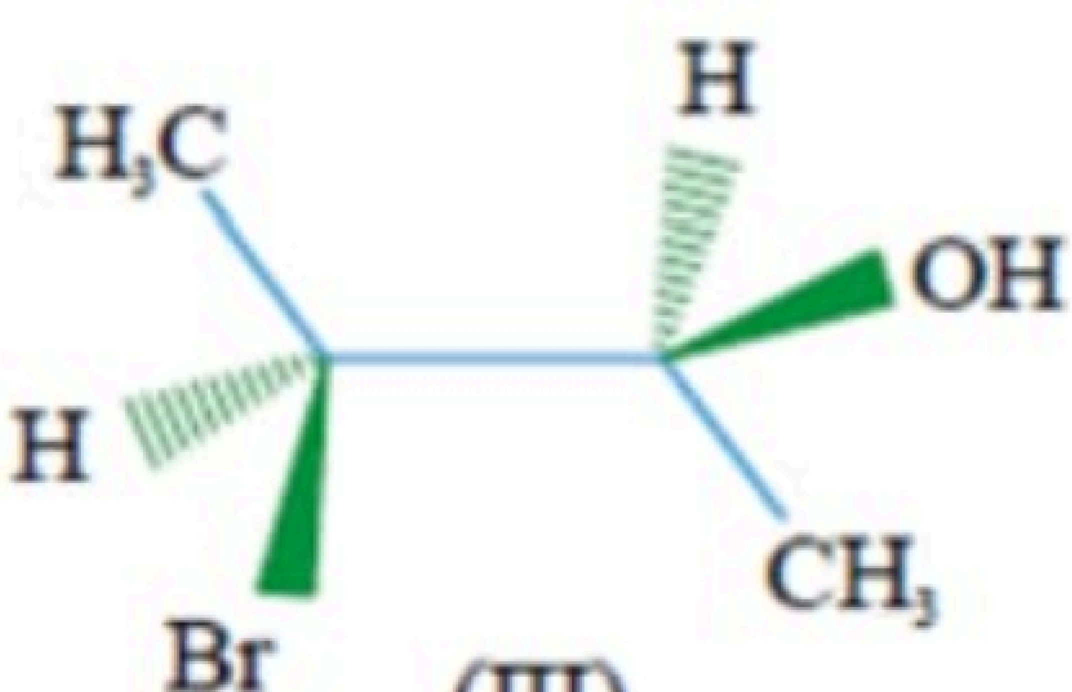
In the following structures



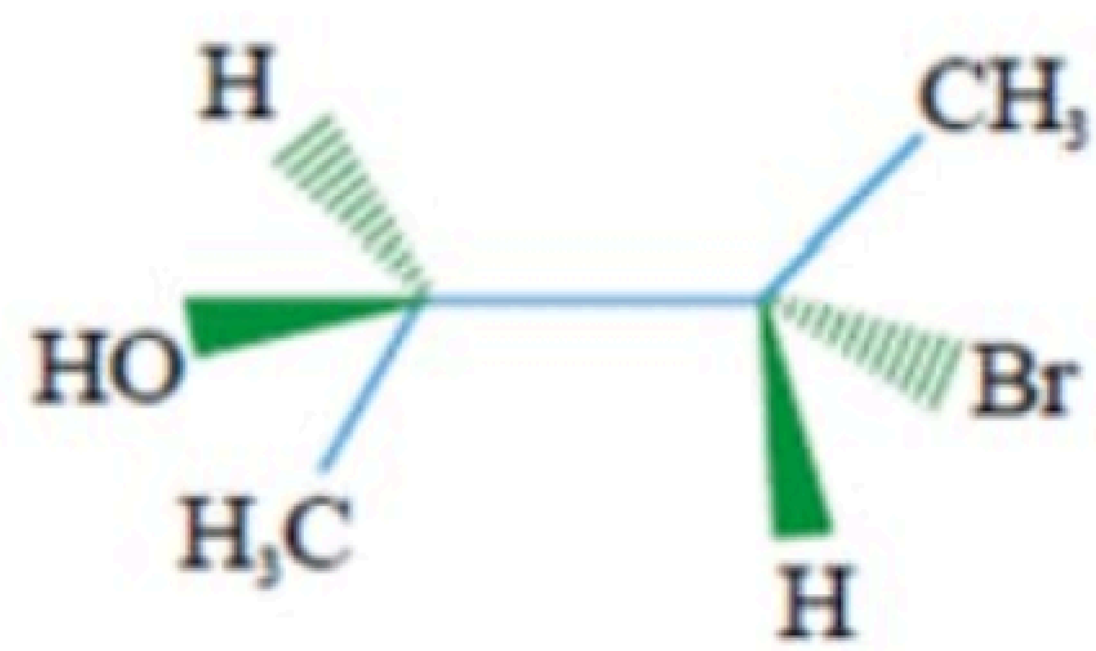
(I)



(II)



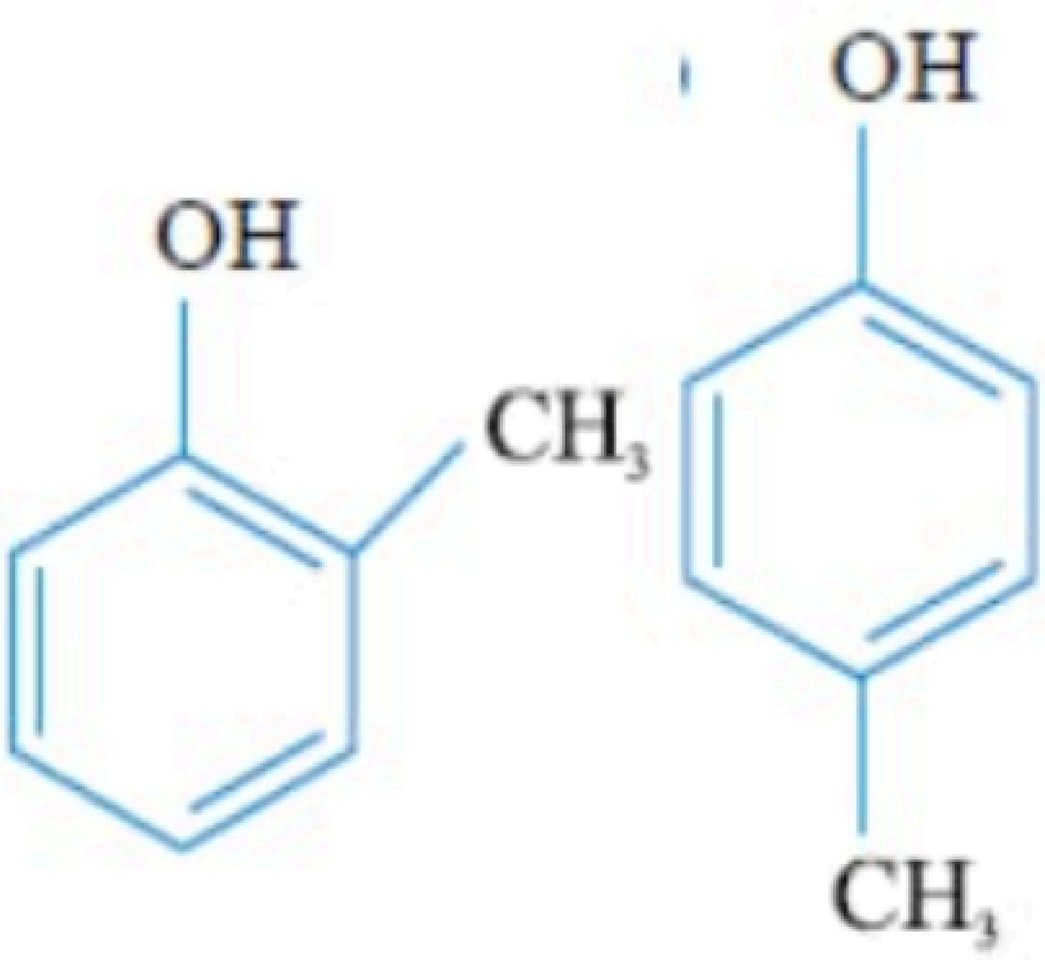
(III)



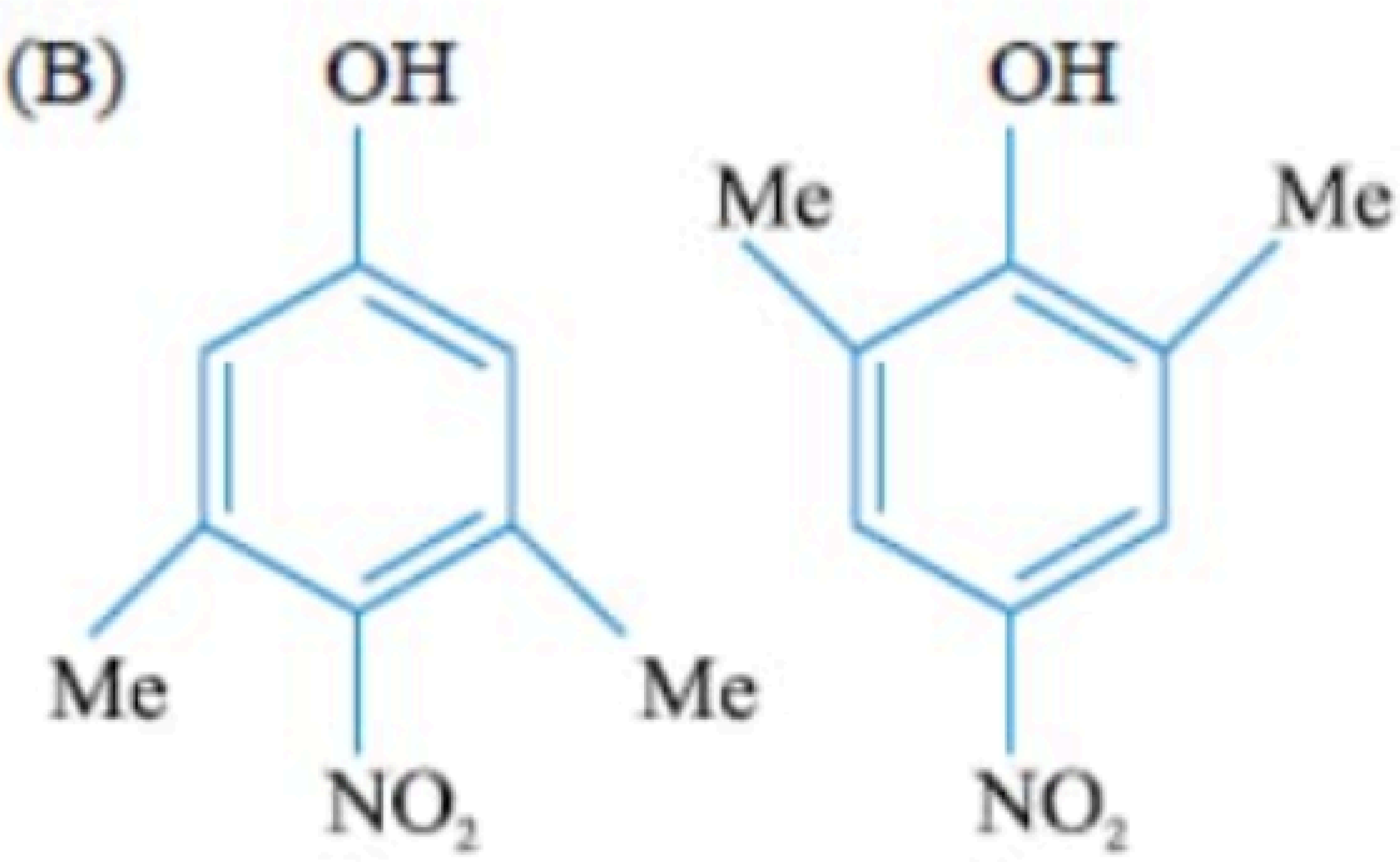
(IV)

In which of the following first is more acidic than second

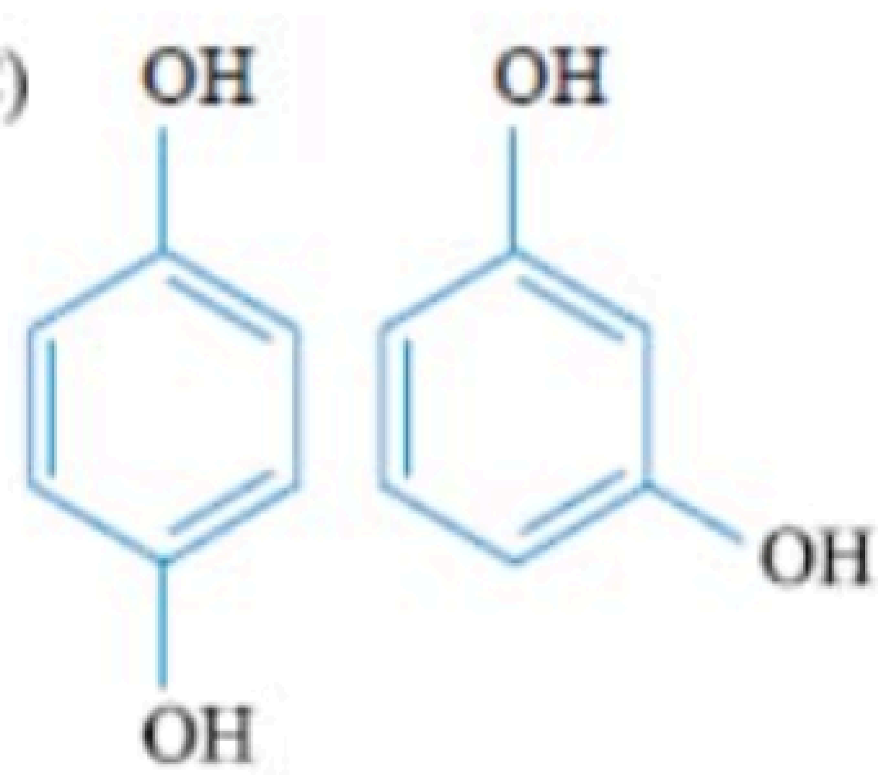
(A)



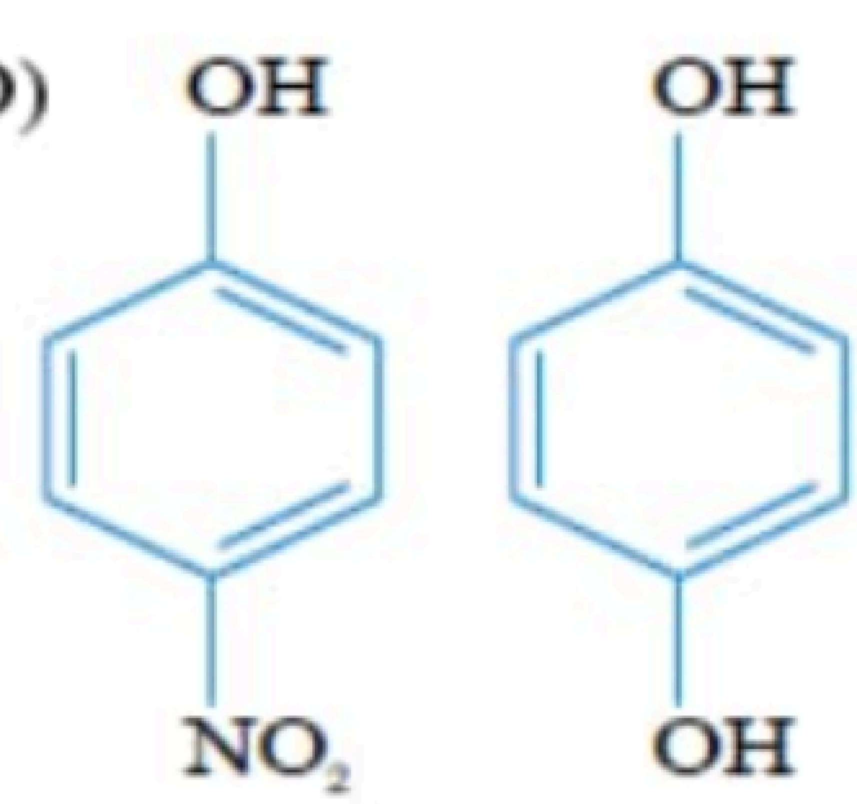
(B)



(C)



(D)



Which of the following elimination reactions will occur to give but-1-ene as the major product?

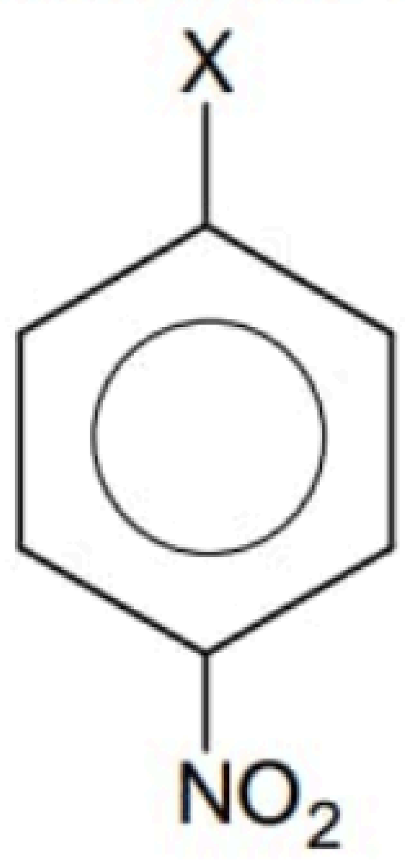
(A) $CH_3.CHCl.CH_2.CH_3 + KOH \xrightarrow{EtOH}$

(B) $\underset{\displaystyle NMe_3}{CH_3.\overset{}{CH_2}.CHCH_3} + NaOEt \xrightarrow[\Delta]{EtOH}$

(C) $CH_3.CH_2.CHCl.CH_3 + Me_3CoK \xrightarrow{\Delta}$

(D) $CH_3.CH_2.CH(OH).CH_3 + conc.H_2SO_4 \xrightarrow[\Delta]{}$

Match the following:



List-I X = Halongen		List-II relative reactivity toward S_NAr	
(P)	–F	(1)	312
(Q)	– Cl	(2)	1
(R)	– Br	(3)	0.6
(S)	–I	(4)	0.8

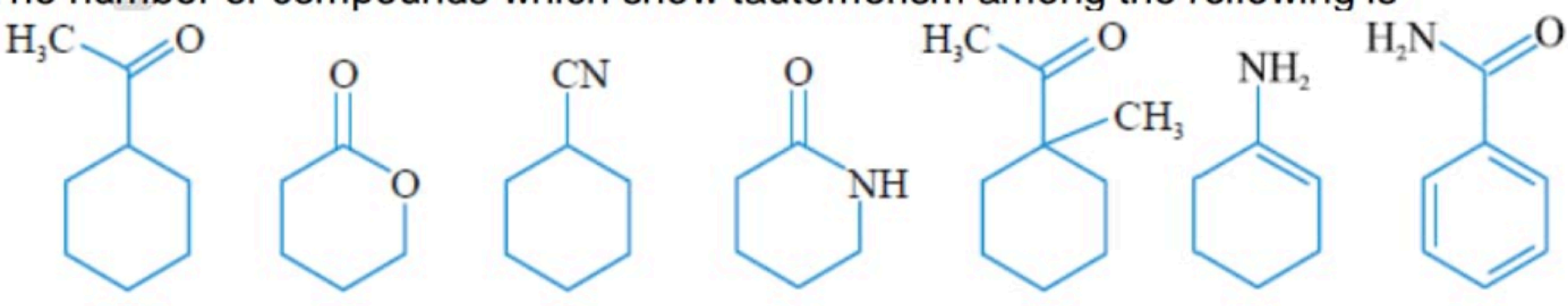
(A) P–1, Q–2; R–4; S–3
(B) P–3, Q–2; R–4; S–1
(C) P–2, Q–1; R–4; S–3
(D) P–1, Q–2; R–3; S–4

Match the following

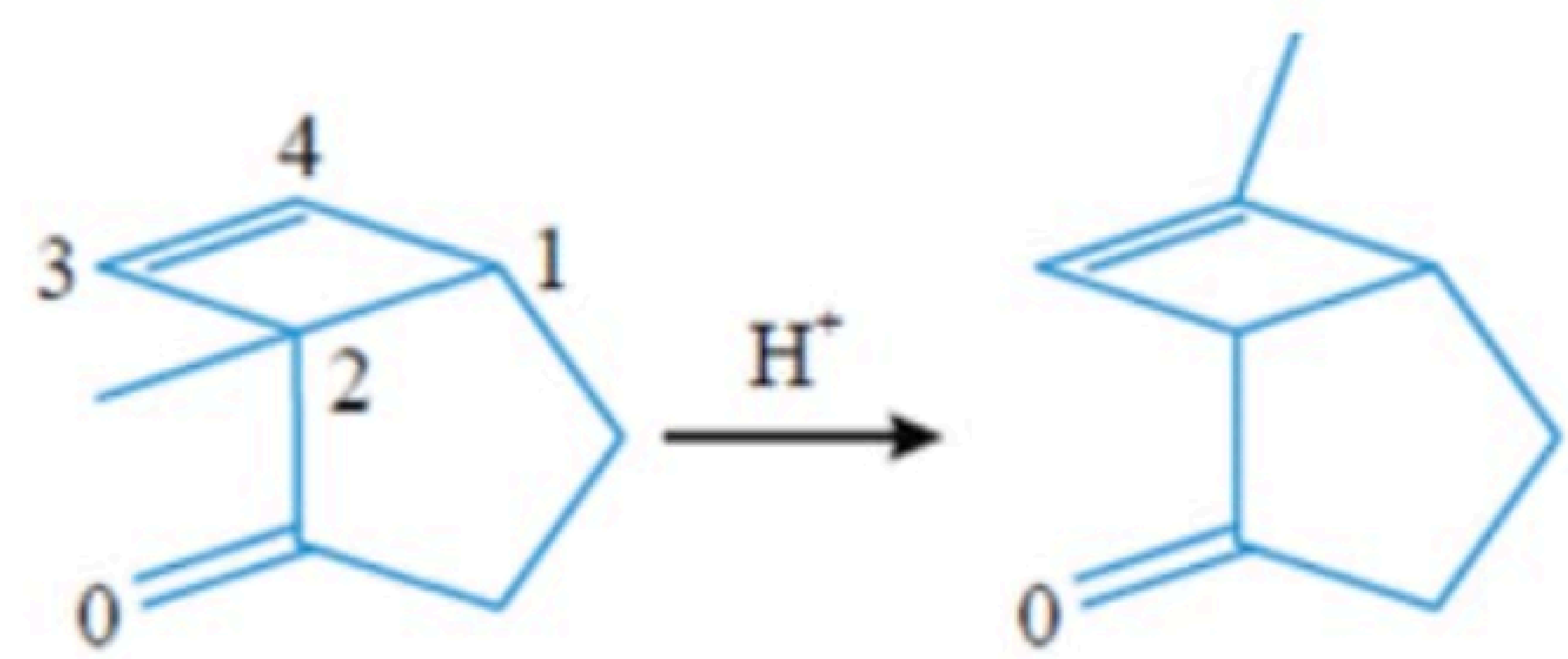
List-I (Property of alkali metal)		List-II(Property)	
(P)	Density	(1)	Li > Na > K
(Q)	Atomic radius	(2)	Li < Na < K
(R)	Heat of atomisation	(3)	Li < K < Na
(S)	Magnetic moment of cation	(4)	Li = Na = K

(A) P–4; Q–3; R–1; S–4;
(B) P–3; Q–2; R–1; S–4;
(C) P–4; Q–1; R–3; S–2;
(D) P–1; Q–2; R–3; S–4;

The number of compounds which show tautomerism among the following is



Give the numberj of carbon atom, attached to methyl group in the product formed, as per the indicated numbering in the reactant, in the following reaciton.



The value of $\sum_{r=1}^{1024} [\log_2 r]$ is equal to, ([.] denotes the greatest integer function)

(A) 8192 (B) 8204
(C) 8194 (D) none of these.

If $4x + 7y + 5z = 20$, then the maximum value of $x^2 y^3 z^5$ is (where x, y, z are positive real numbers)

(A) $2^8 \cdot \dfrac{7^3}{3^3}$

(B) $2^{10} \cdot \left(\dfrac{7}{3}\right)^3$

(C) $2^8 \cdot \dfrac{3^3}{7^3}$

(D) None of these.

If n arithmetic mean are inserted between two numbers where the p^{th} arithmetic mean is equal to $\frac{1}{q}$ and $\left(\frac{p+q}{2}\right)^{th}$ arithmetic mean is $\frac{1}{2}\left(\frac{1}{p}+\frac{1}{q}\right)$, then q^{th} arithmetic mean is

(A) $\frac{1}{2q}$

(B) $\frac{1}{2p}$

(C) $\frac{1}{p}$

(D) $\frac{1}{q}$

A party of 6 person consist of 2 Indians, 2 Americans and 2 Englishmen. The number of ways they sit such that no two men of same nationality are next to one another

(A) in a row is 240

(B) at a round table is 32

(C) is a row is 120

(D) None of these

If [.] is the greatest integer function, ω is non-real cube root of unity and n a natural number greater than or equal to 1, then the sum ${}^{n}C_1 + {}^{n}C_4 + {}^{n}C_7 + \ldots\ldots\ldots {}^{n}C_{3\left[\frac{n}{3}\right]+1} =$

(A) $\dfrac{2^n + (-1)^n (\omega)^{n+1} + (-1)^n (\omega)^{2n+2}}{3}$

(B) $\dfrac{2^n + (-1)^n (\omega)^{n+1} + (-1)^n (\omega)^{2n+1}}{3}$

(C) $\dfrac{2^n + (-1)^n \left(2\sin\left(\dfrac{2(n+1)\pi}{3}\right)\right)}{3}$

(D) $\dfrac{2^n + (-1)^n \left(2\cos\left(\dfrac{2(n+1)\pi}{3}\right)\right)}{3}$

Match the statement of list–I with values of list–II

List–I		List–II	
(P)	In a ΔABC, let $\angle C = \frac{\pi}{2}$, r = inradius, R = circumradius then $2(r+R)$	(1)	$a+b+c$
(Q)	If l, m, n are perpendicular drawn from the vertices of triangle having sides a, b and c then $\sqrt{2R\left(\frac{bl}{c}+\frac{cm}{a}+\frac{an}{b}\right)+2ab+2bc+2ca}$	(2)	$a-b$
(R)	In a ΔABC, $R(b^2\sin 2C + c^2 \sin 2B)$ equals	(3)	$a+b$
(S)	In a right-angle triangle ABC, $\angle C = \frac{\pi}{2}$, then $4R\sin\frac{A+B}{2}\sin\frac{(A-B)}{2}$	(4)	abc

(A) P–3; Q–1; R–4; S–2
(B) P–3; Q–4; R–1; S–2
(C) P–3; Q–1; R–2; S–4
(D) P–2; Q–4; R–3; S–2

Match List – I with List - II

	List – I		List - II
(P)	No. of possible 4 digit no. of the form $a_1a_2a_3a_4$ such that $a_1 > a_2 \geq a_3 > a_4$	(1)	62
(Q)	No. of divisor of $n = 2^3 \times 7^8 \times 5^6$ of the form $4\lambda+2, \lambda \geq 1$	(2)	$5^{10} - {}^5C_1 5^9 + {}^5C_2 5^8 - {}^5C_3 5^7 + {}^5C_4 5^6 - {}^5C_5 5^5$
(R)	If $f : \{x_1, x_2, x_3, x_4 \ldots\ldots x_{10}\} \to \{y_1, y_2, y_3, y_4, y_5\}$ then no. of possible function in which $f(x_i) \neq y_i$	(3)	330
(S)	Number of triangles can be formed by joining the 3 vertices of a convex polygon of 35 diagonals	(4)	120

(A) P–1; Q–2; R–2; S–4
(B) P–1; Q–1; R–2; S–3
(C) P–4; Q–1; R–2; S–3
(D) P–3; Q–1; R–2; S–4

If $|\cos\alpha\cos\beta\cos\gamma| = \frac{2}{3}$ then maximum value of $\tan\alpha\tan\beta + \tan\beta\tan\gamma + \tan\gamma\tan\alpha$ is $\frac{p}{q}$,
Then the value of $p + q$ is _____

Consider a set {1, 2, 3, ….,100}. The number of ways in which a number can be selected from the set so that it is of the form x^y, where x, y, $\in$ N and $\geq$ 2, is

Let S be the set of 6-digit numbers $a_1a_2a_3a_4a_5a_6$ (all digits distinct) where $a_1 > a_2 > a_3 > a_4 < a_5 < a_6$. Then n(S) is equal to

Let λ be the greatest integer for which $5p^2-16, 2p\lambda, \lambda^2$ are distinct consecutive terms of A.P., where $p \in R$. If the common difference of an AP is $\frac{m}{n}$, $m,n \in N$ and m, n are relative prime, then value of $m+n$ is

The number of divisors of 3630, which have a remainder of 1 when divided by 4, is

Let $a_1, a_2......a_n$ be real numbers in A.P. Such that $a_1 = 15$ and a_2 is an integer. Given $\sum_{r=1}^{10} (a_r)^2 = 1185$. If $S(n) = \sum_{r=1}^{n} a_r$, then find the maximum value of n for which $s(n) \geq s(n-1)$.

Match the following:

List–I		List–II	
(P)	If $\sum n = 210$, Then $\sum n^2$ is divisible by the greatest prime number which is greater than	(1)	16
(Q	Between 4 and 2916 is inserted odd number (2n+1) GM's then the $(n+1)^{th}$ G.M is divisible by the greatest odd integer which is less than	(2)	10
(R	In a certain progression four consecutive terms are 40, 30, 24, 20. Then the integral part of next term of progression is more than	(3)	34
(S)	$1+\frac{4}{5}+\frac{7}{5^2}+\frac{10}{5^3}+.....\infty=\frac{a}{b}$ where H.C.F (a, b) = 1 then a – b is less than	(4)	30
		(5)	0

(A) P –1,2,3; Q–1,2,3,4,5; R–1,2,5; S–3,4
(B) P–1,2,3,4,5; Q–1,2; R–1,2,3; S–5
(C) P–1,2,3,4,5; Q–3,4; R–1,2,5; S–3,4
(D) P–3,4; Q–1,2,3,4,5; R–1,2,5; S–3,4

Match the following List – I with List – II

List–I		List–II	
(P)	If θ_1, $\theta_2\theta_3$ are three values lying in $[0, 3\pi)$ for which $\tan\theta = \lambda$, then the value of $\left\|\tan\left(\frac{\theta_1}{3}\right)\tan\left(\frac{\theta_2}{3}\right)+\tan\left(\frac{\theta_2}{3}\right)\tan\left(\frac{\theta_3}{3}\right)+\tan\left(\frac{\theta_3}{3}\right)\tan\left(\frac{\theta_1}{3}\right)\right\|$ is	(1)	3
(Q)	The diagonals of a parallelogram are inclined to each other at an angle of 45°, while its sides a and b (a > b) are inclined to each other at an angle of 30°. Then the value of $\frac{a}{b}$ is	(2)	$\frac{\sqrt{5}+1}{2}$
(R)	The smallest side of a right-angle triangle with integer sides is 23, then the perimeter of the triangle is	(3)	23×24
(S)	If $\sin\theta$ and $-\cos\theta$ are the roots of the equation $ax^2 - bx - c = 0$, where a, b, and c are the sides of a triangle ΔABC, if cos B is equal to $\left(\lambda+\mu\frac{c}{a}\right)$, then $\lambda + \mu$ is	(4)	$\frac{3}{2}$

(A) P – 1, Q – 2, R – 4, S – 3
(B) P – 4, Q – 3, R – 2, S – 1
(C) P – 2, Q – 1, R – 4, S – 3
(D) P – 1, Q – 2, R – 3, S – 4

Let Z_1 & Z_2 ($Z_1 = Z_2$)be two points in an Argand plane. If $a|Z_1| = b|Z_2|$, (where a, b $\in$ R) then the points $\dfrac{aZ_1 - bZ_2}{aZ_1 + bZ_2}$ is

(A) In the I quadrant
(B) In the III quadrant
(C) On the real axis
(D) On the imaginary axis

Which of the following options are correct

(A) $\left[\left({}^nC_0 + {}^nC_3 + {}^nC_6 + \ldots\right) - \frac{1}{2}\left({}^nC_1 + {}^nC_2 + {}^nC_4 + {}^nC_5\right)\right]^2 + \frac{3}{4}\left({}^nC_1 - {}^nC_2 + {}^nC_4 - {}^nC_5 \ldots\right)^2 = 1$

(B) If a and b are two positive numbers such that $a^5b^2 = 4$ then maximum value of $\log_{2^{1/5}}\left(a^2\right).\log_{2^{1/2}}\left(b^2\right)$ is equal to 4

(C) Constant term in $\left(\left(\left(\left(\left((x-2)^2-2\right)^2-2\right)^2-2\right)^2-2\right)^2 \ldots -2\right)^2$ is 3

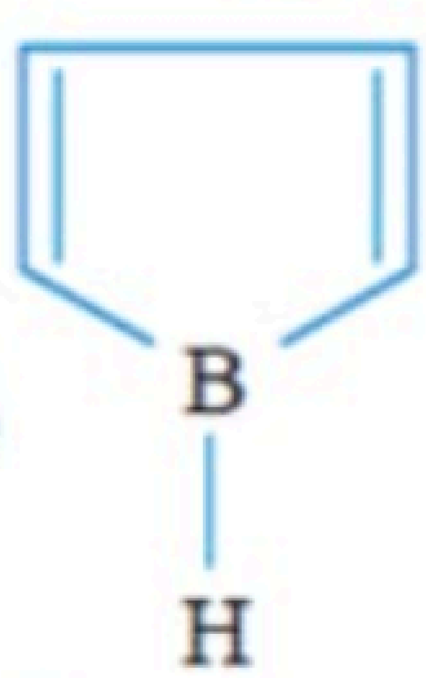
(D) The coefficient of x^{24} in $\left(\frac{{}^{25}C_1}{{}^{25}C_0} - x\right)\left(x - 2^2.\frac{{}^{25}C_{25}}{{}^{25}C_1}\right)\left(x - 3^2.\frac{{}^{25}C_3}{{}^{25}C_2}\right) \ldots\ldots \left(x - 25^2.\frac{{}^{25}C_{25}}{{}^{25}C_{24}}\right)$ is equal to 2925

How many of the following are aromatic in nature

(A) 

(B) Ferrocene

(C) Cyclo penta dienyl cation

(D) 

(E) Phenanthracene

(E) Phenanthracene

(F) Tropylium ion

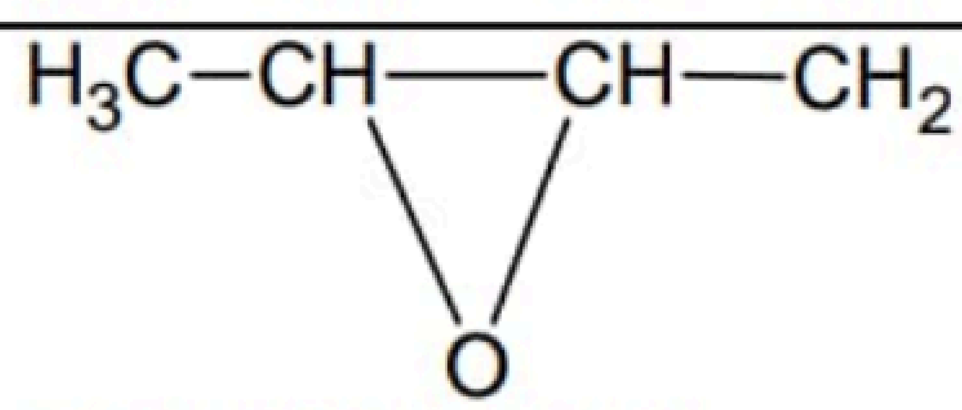
(G) Cyclo penta diene

(H) cyclo octa tetraene

The number of possible enantiomeric pairs that can be produced during mono chlorintion of 2-methylbutane is

The number of different enols formed by Acetyl acetone is

Match the List I with II and choose the correct option from the codes given below:

List-I		List-II	
(P)	CO_2	(1)	Electrophile
(Q)	NO_2^-	(2)	Ambident nucleophile
(R)	$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-H$	(3)	Ambident substrate
(S)		(4)	Electrophile as well as nucleophile

(A) P–1; Q–2; R–4; S–3
(B) P–2; Q–1; R–4; S–3
(C) P–3; Q–4; R–2; S–1
(D) P–1; Q–2; R–3; S–4

Match the following

List -I		List-II	
(P)	Borax $\xrightarrow{\Delta}$	(1)	BN
(Q)	$B_2H_6 + H_2O \rightarrow$	(2)	B_2N_6
(R)	$B_2H_6 + NH_{3(excess)} \xrightarrow[\text{high temp.}]{\Delta}$	(3)	H_3BO_3
(S)	$BCl_3 + LiAlH_4 \rightarrow$	(4)	$NaBO_2$
		(5)	B_2O_3

Choose the correct match.

(A) P–4,5; Q–3; R–1; S –2

(B) P–3; Q–4,5; R–1; S –2

(C) P–3; Q–1; R–4,5; S –2

(D) P–3; Q–1; R–2; S –4,5

Find the correct statements.

(A) Structure II is a meso compound

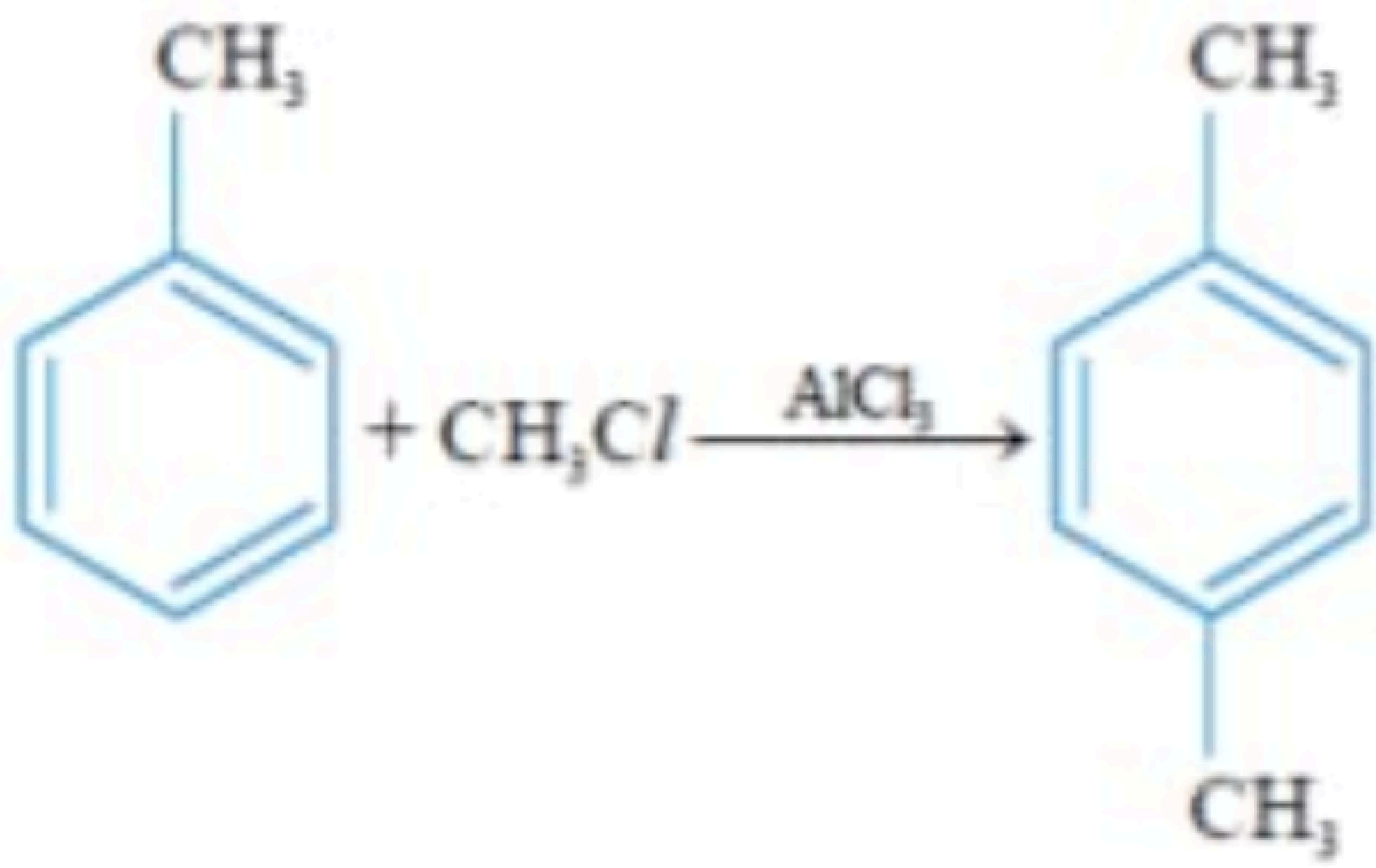
(B) Structures I & III are diastereomers

(C) Structures III & IV are diastereomers

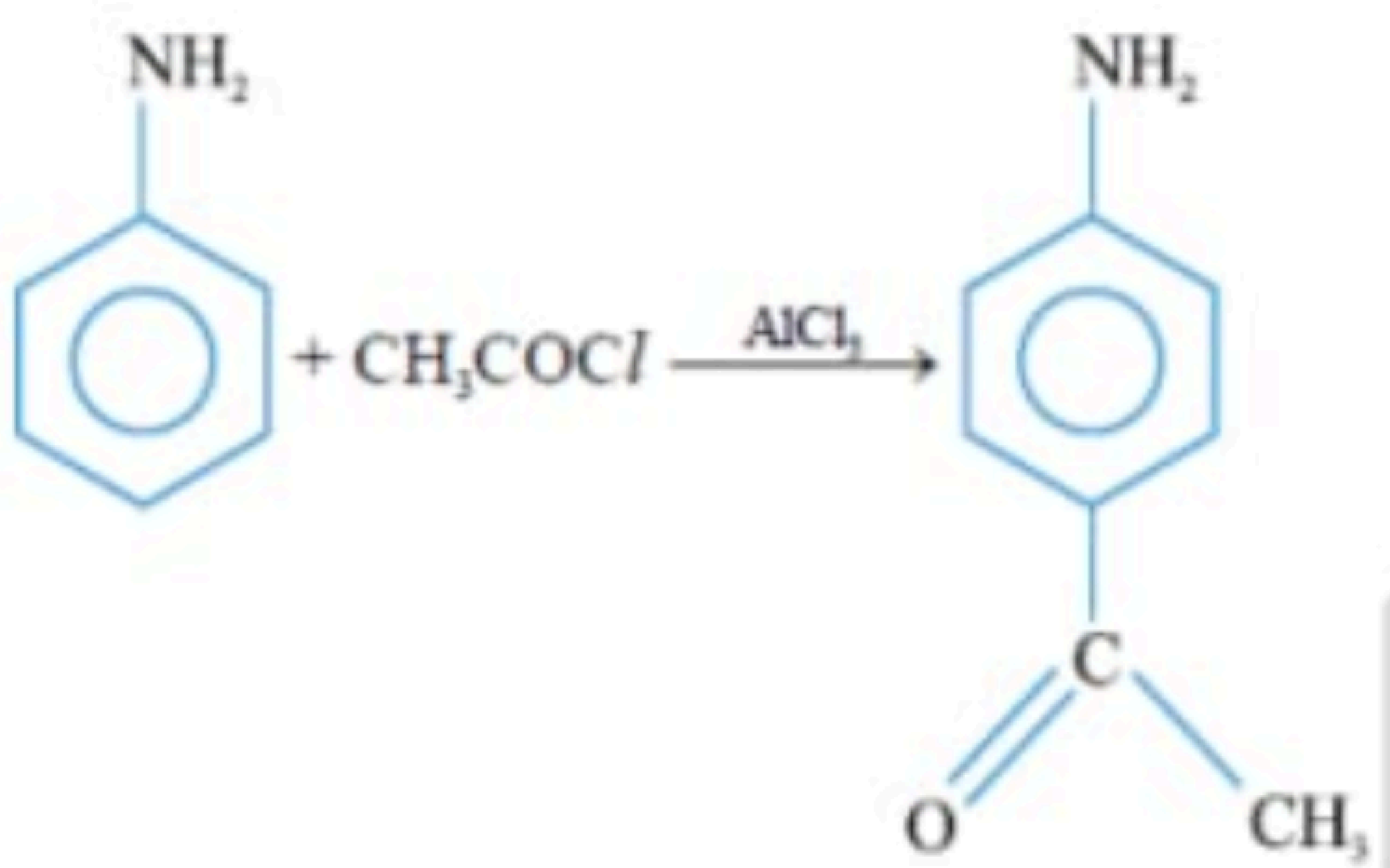
(D) Structures I & IV are enantiomers

Which of the following will fail to produce the product shown

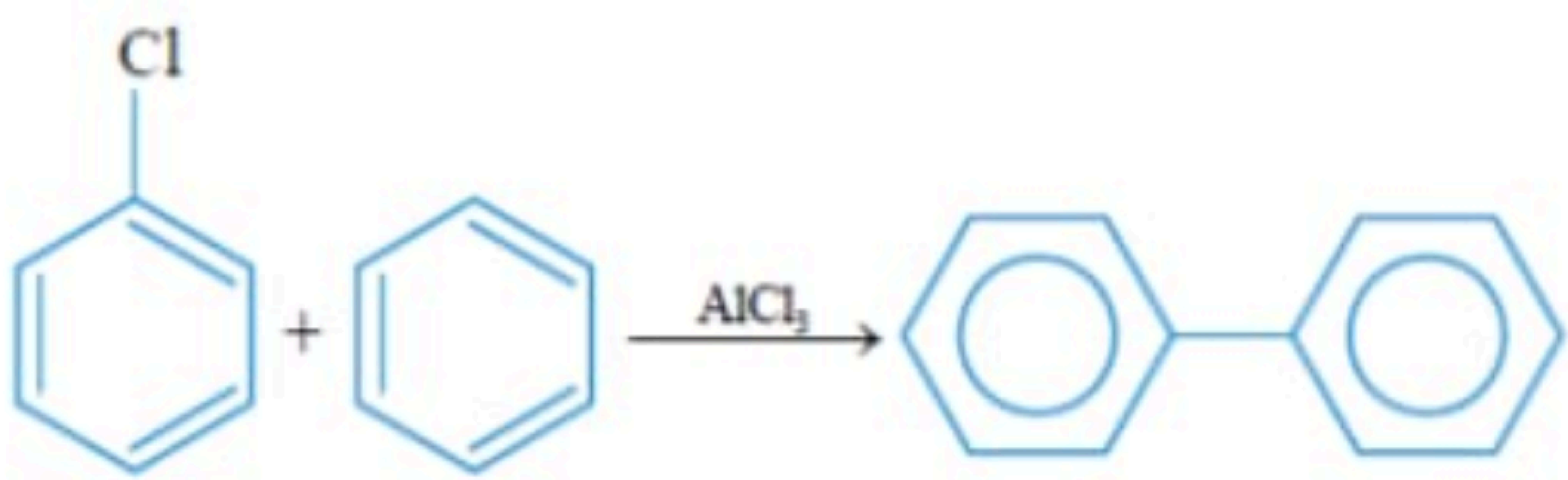
(A)



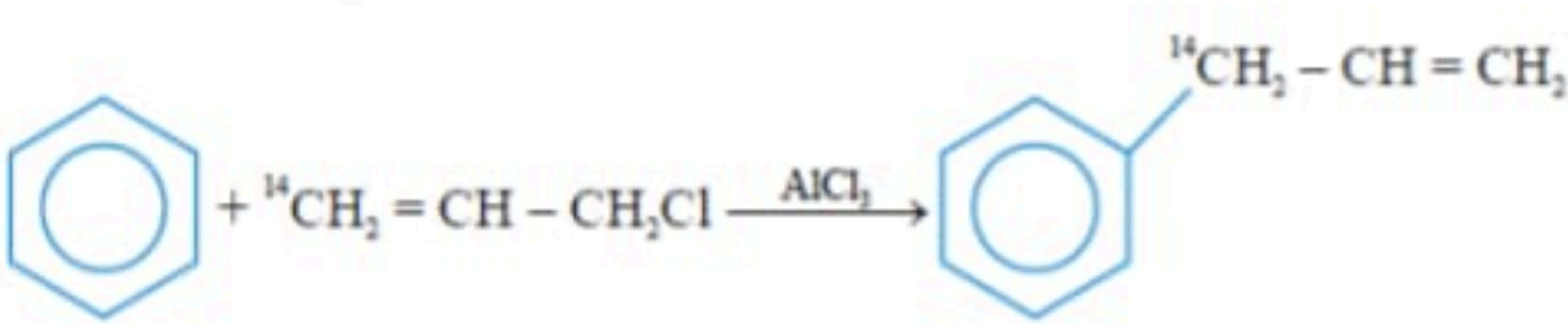
(B)



(C)



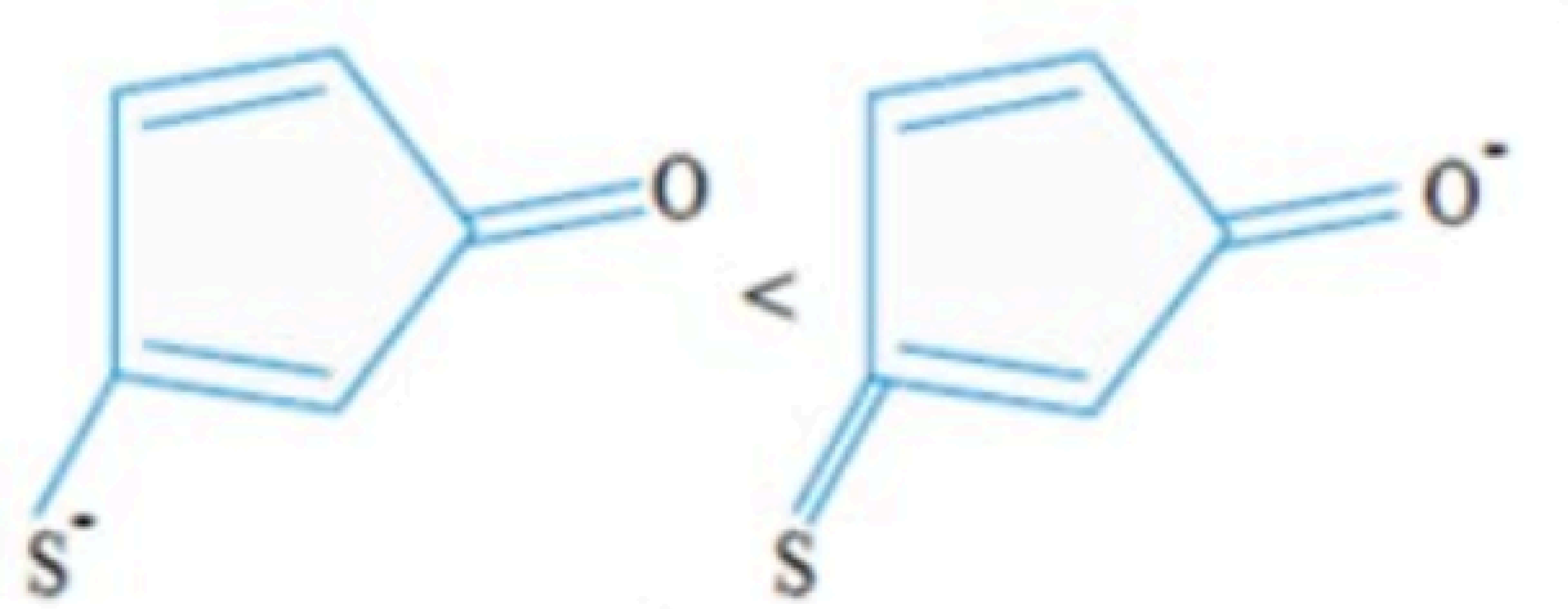
(D)



Which of the following is incorrect comparison of stability?

(A) $^{-}CH_2-\overset{\overset{O}{\|}}{C}H < CH_2=\overset{\overset{O^{-}}{|}}{C}H$

(B) $\overset{+}{C}H_2-F > CH_2=\overset{+}{F}$

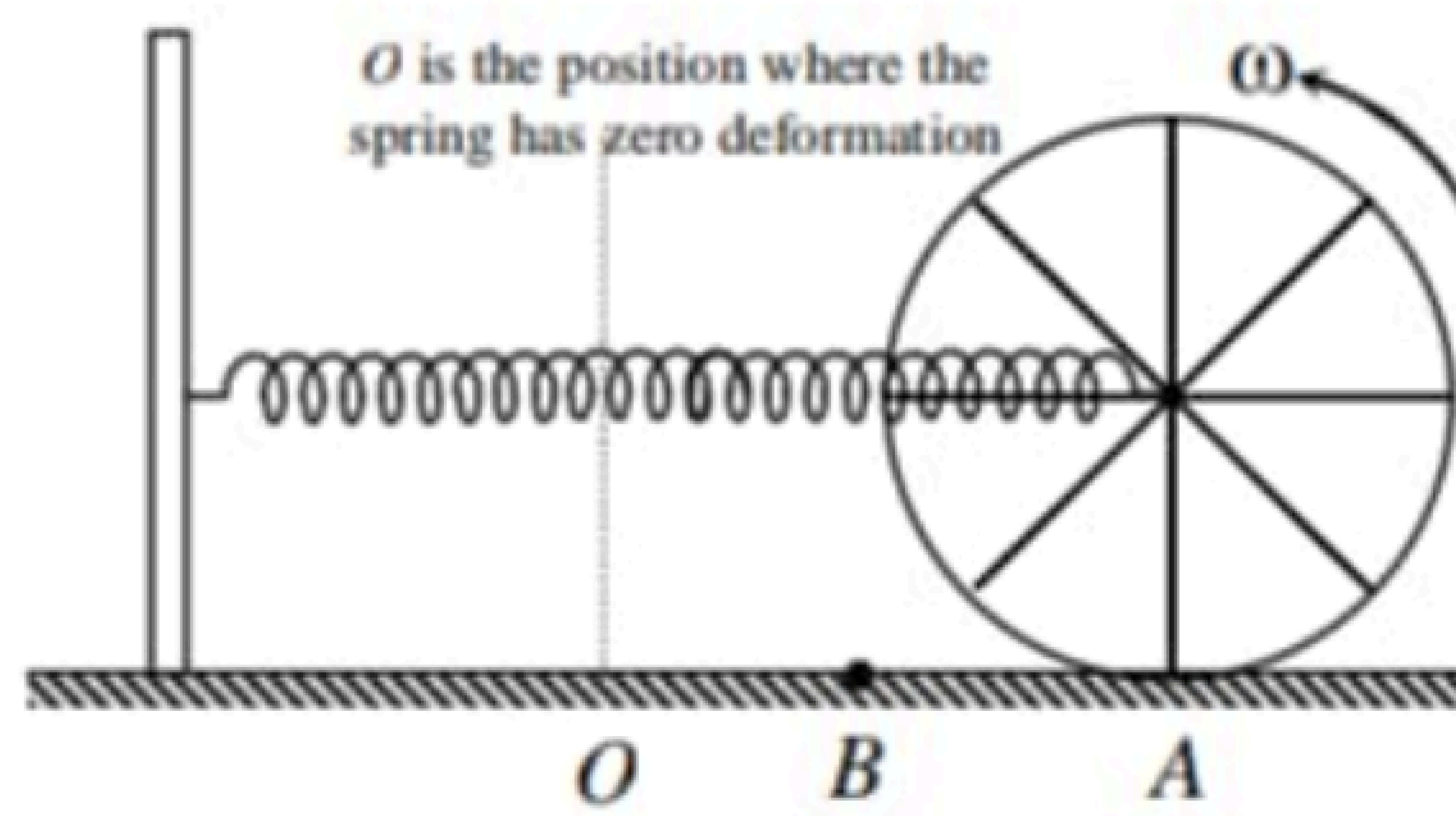
(C) 

(D) $CH_2=CH-F > \overset{-}{C}H_2-CH=\overset{+}{F}$

Imagine a light planet revolving around a very massive star in a circular orbit of radius R with a period of revolution T. If the gravitational force of attraction between the planet and the star is inversely proportional to $R^{5/2}$, then the time period of revolution is proportional to $R^{k/4}$. Find the value of k.

A wire forming a loop is dipped into soap solution and taken out, so that a film of soap solution is formed. A loop of 6.28 cm long thread is gently put on the film is pricked with a needle inside the loop. The thread loop takes the shape of a circle. Find the tension in the thread in (10^{-4} N). Surface tension of soap solution = 0.03 N/m.

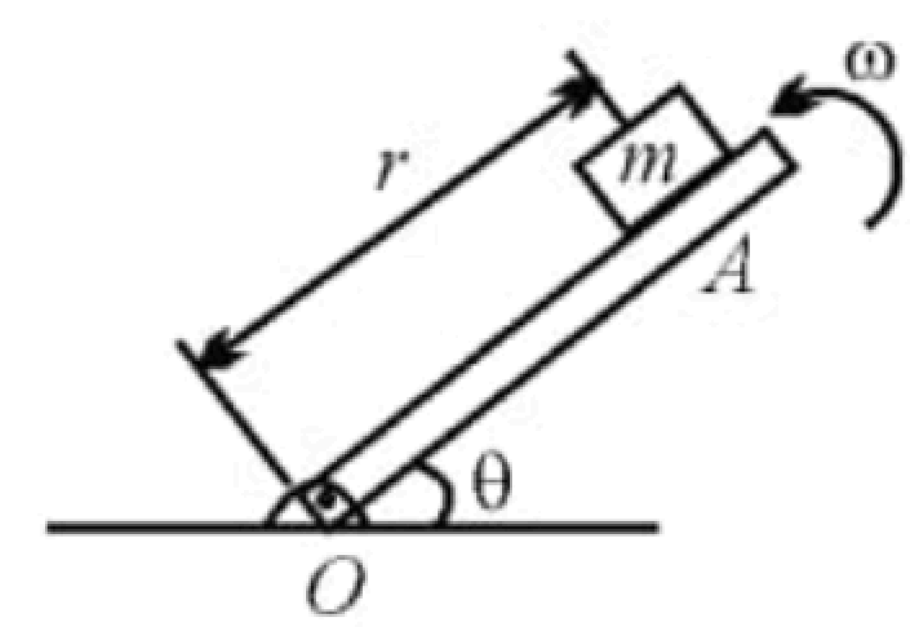
A uniform ring of mass M =1kg has massless spokes. A spring of stiffness constant K =1 N/m is attached to the centre of the ring at one end and the other end is fixed to the wall as shown in the figure. The ring is given an angular velocity ω and released from point A. As it reaches point B its velocity of centre of mass becomes V = 1m/s, where $V = R\omega$. The surface to the left of point B is perfectly rough, so that no slipping takes place. There is a point O on the rough part which corresponds to zero deformation of spring.



List -I	List-II
(P) The time taken by the ring to go from A to B is (in sec)	(1). $\sqrt{2}\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$
(Q) The time taken by the ring to go from B to O is (in sec)	(2). $\frac{\pi}{4}$
(R) Velocity of centre of mass at O is (m/s)	(3). $\sqrt{3}$
(S) The maximum compression of the spring (in m)	(4). $\sqrt{\frac{3}{2}}$
	(5). $\sqrt{\frac{1}{2}}$

(A) P – 2, Q – 1, R – 4, S – 3
(B) P – 1, Q – 2, R – 4, S – 3
(C) P – 2, Q – 1, R – 3, S – 4
(D) P – 1, Q – 2, R – 3, S – 5

A plank OA rotates in vertical plane about a horizontal axis through O with a constant counter clockwise angular velocity of 3 rad/sec. As it passes the position $\theta = 0$, a small mass m is placed upon it at a radial distance (r) of 0.5 m. If the mass is observed to slip at $\theta = 37^\circ$, the coefficient of friction between the mass and the plank is $\frac{n}{1000}$. Find the value of n.



Match the following

List– I		List– II	
(P)	The object moves on the x-axis under a conservative force in such a way that its "speed" and position" satisfy $v = c_1\sqrt{c_2 - x^2}$ where c_1 and c_2 are positive constants.	(1)	The object executes a simple harmonic motion.
(Q)	The object moves on the x-axis in such a way that its velocity and its displacement from the origin satisfy $v = -kx$, where k is a positive constant.	(2)	The object does not change its direction.
(R)	The object is attached to one end of a massless spring of a given is attached to the ceiling of an elevator. Initially everything is at rest. The elevator starts going upwards with a constant acceleration a. The motion of the object is observed from the elevator during the period it maintains this acceleration.	(3)	The kinetic energy of the object keeps on decreasing.
(S)	The object is projected from the earth's surface vertically upwards with a speed $2\sqrt{GM_e / R_e}$, where, M_e is the mass of the earth and R_e is the radius of the earth, Neglect forces from objects other than the earth.	(4)	The object can change its direction only once

(A) P – 1, Q – 2, R – 2, S – 1
(B) P – 1, Q – 2,3, R – 1, S – 2,3
(C) P – 1, Q – 3, R – 4, S – 3
(D) P – 1, Q – 4, R – 2, S – 3

A body of mass m is attached to a spring of spring constant k which hangs from the ceiling of an elevator at rest in equilibrium. Now the elevator starts accelerating upwards with its acceleration varying with time as $a = pt + q,$ where p and q are positive constants. In the frame of elevator

(A) the block will perform SHM for all value of p and q
(B) the block will not performs SHM in general for all value of p and q expect p = 0
(C) the block will perform SHM provided for all value of p and q expect p = 0
(D) the velocity of the block will vary simple harmonically for all value of p and q.