LIVE

JEE MAIN 2024

ATTEMPT – 01 , 27TH JAN 2024 , SHIFT - 02

PAPER DISCUSSION

CHEMISTRY

INORGANIC CHEMISTRY

Identify from the following species in which d^2sp^3 hybridization is shown by central atom.

(A) BrF_5 — $1+5=6$ — sp^3d^2

(B) $[PtCl_4]^{2-}$ — Pt^{2+} (d^8) — dsp^2

(C) SF_6 — sp^3d^2

(D) $[Co(NH_3)_6]^{3+}$

Co^{3+} : d^6

Choose the incorrect pair from below pairs:

(A) Haber process – Iron

(B) Polyethene – $TiCl_4/Al(CH_3)_3$

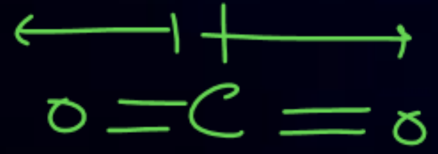
(C) Wacker process – $PtCl_2$ ($PdCl_2$)

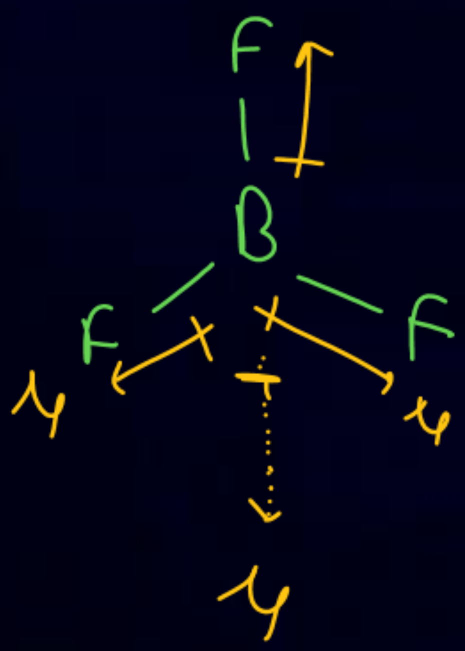
(D) Photography - AgBr

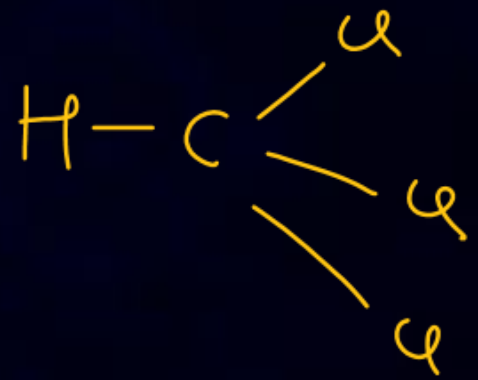
The total number of non-polar molecule are

H_2O, CO_2, SO_2, CH_4, NH_3, BF_3, $CHCl_3$, H_2, H—F

H_2O	CO_2	SO_2	CH_4	NH_3	BF_3	$CHCl_3$	H_2	H—F
P	NP	P	NP	P	NP	P	NP	P







Which of the following group has d^{10} configuration?

(A) Cr, Cd, Cu, Ag

(B) Cd, Cr, Ag, Zn

(C) Ag, Cr, Cu, Zn

(D) Cu, Cd, Zn, Ag

3d | 4d | 5d

s^1 → Cu Ag Au Pt Cr Mo Ru Rh

Pd → s^0

The value of magnetic moment for the complex is $[Pt(NH_3)Cl_2(CH_3NH_2)]$

$[Pt(NH_3)_2(CH_3NH_2)Cl]Cl$ (CN = 4)

Pt^{2+} ($5d^8$)

S.P. (dsp^2)

5d: 1L 1L 1L 1L

$n = 0$

$\mu = \sqrt{n(n+2)}$ BM

$= 0$

How many of following ions has/have noble gas configuration? (2)

Sr^{2+}, Cs^{+}, Yb^{2+}, La^{2+}

Inert gas   I.G.

La → [Xe] $6s^2 5d^1$

(1) Ce → [Xe] $6s^2 5d^1 4f^1$

(13) Yb → [Xe] $6s^2 4f^{14}$

(14) Lu → [Xe] $6s^2 5d^1 4f^{14}$

Assertion: Ce^{4+} have inert gas configuration.

$Ce \rightarrow [Xe]\, 6s^2\, 4f^1\, 5d^1$

Reason: Convert to Ce^{3+} because it is strong oxidizing agent.

O.A. $Ce^{+4} \longrightarrow Ce^{+3}$

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

(B) Both A and R are correct, but R is not the correct explanation of A.

(C) A is correct but R is incorrect

(D) A is incorrect but R is correct

ORGANIC CHEMISTRY

Phenolic group can be identified by a positive

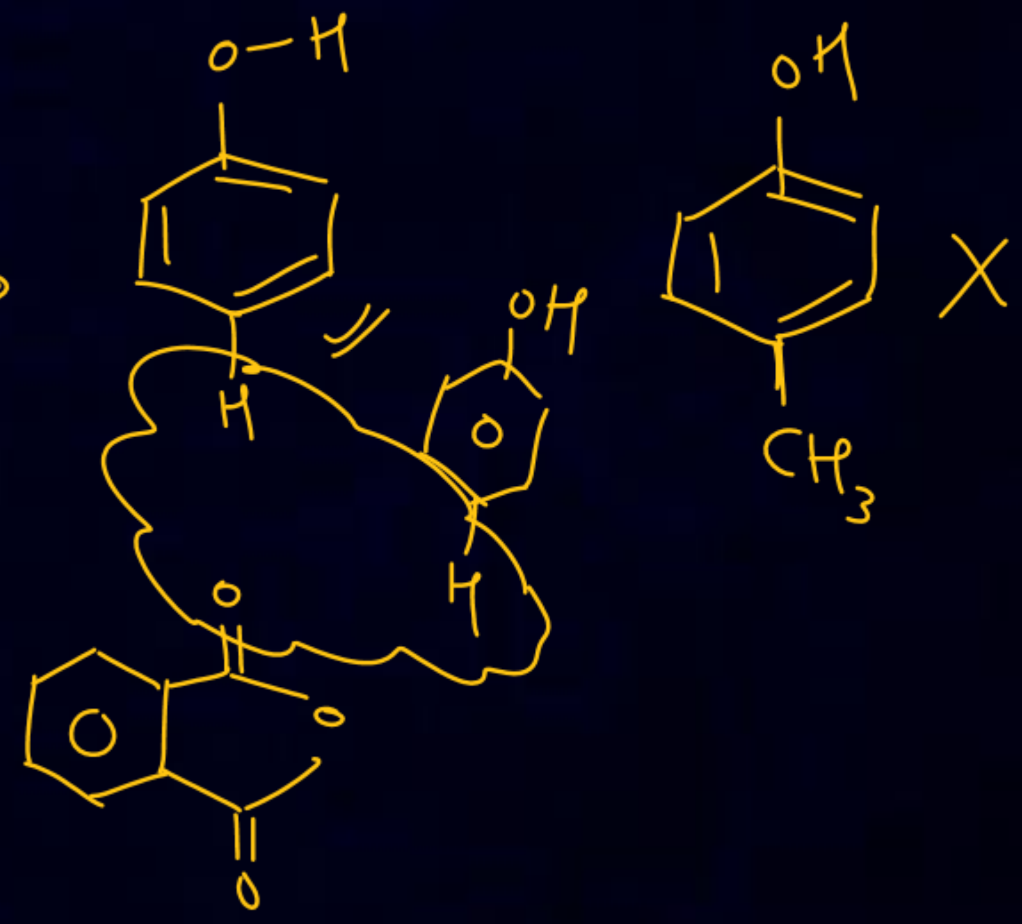
(A) Carbylamine test

$R-NH_2$

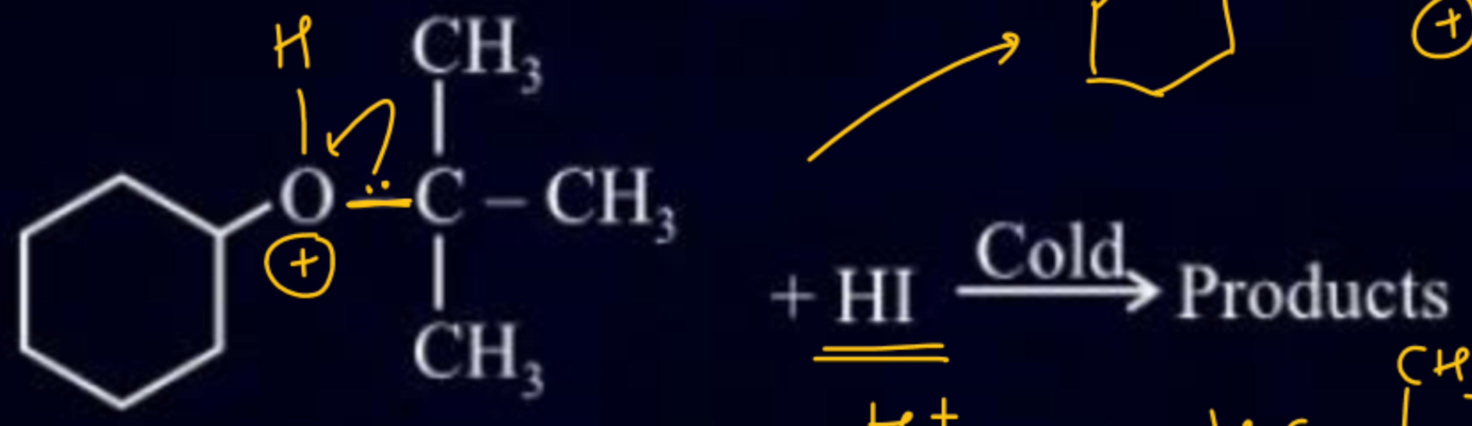
(B) Phthalic test

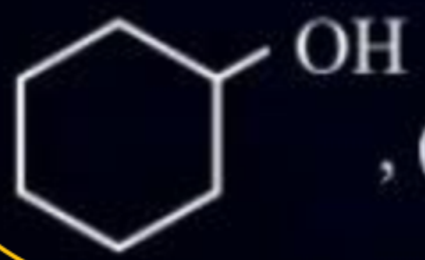
(C) Lucas test

(D) Tollen's test

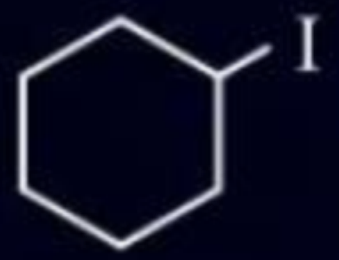


Products for the below reaction are:

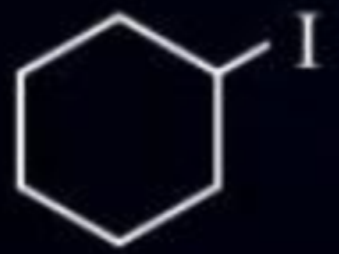


(A) 

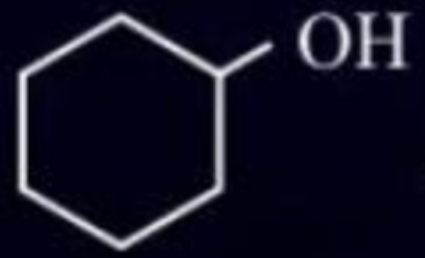
, $(CH_3)_3C–I$

(B) 

, $(CH_3)_3C–I$

(C) 

, $(CH_3)_3C–OH$

(D) 

, $(CH_3)_3C–OH$

Which type of protein structure can not be denaturized by heating.

(A) 1° Protein

(B) 2° Protein

(C) 3° Protein

(D) 4° Protein

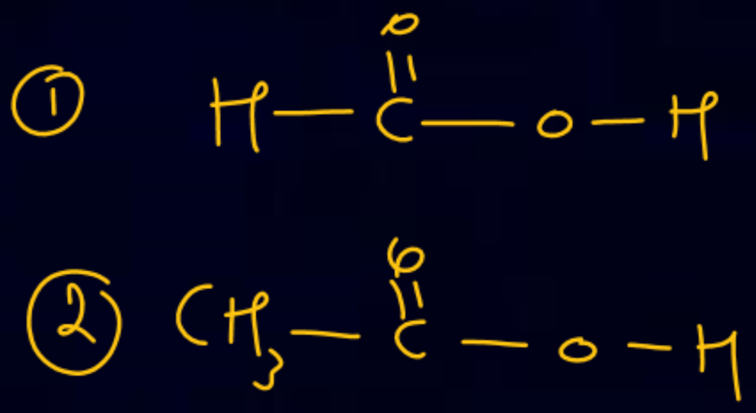
The Second Homologue of monocarboxylic acid is

(A) CH_3CH_2COOH

(B) $HCOOH$

(C) CH_3COOH

(D) $CH_3CH_2CH_2COOH$



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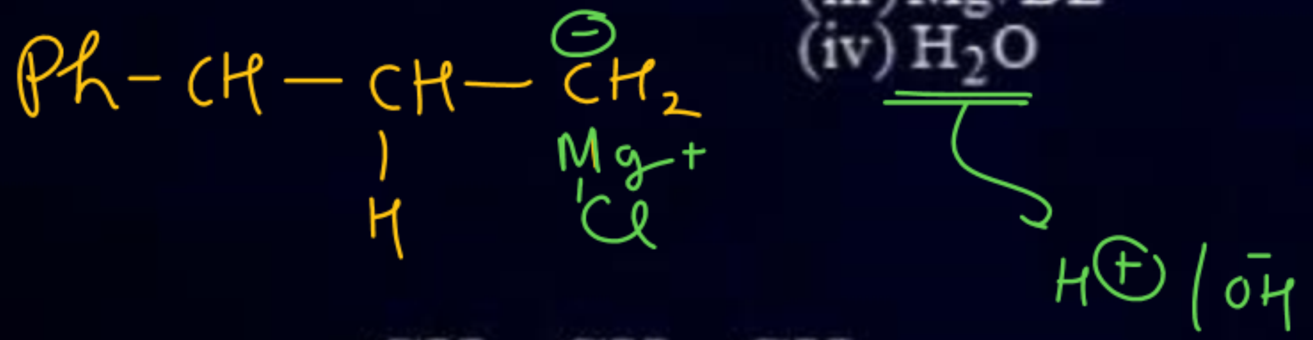
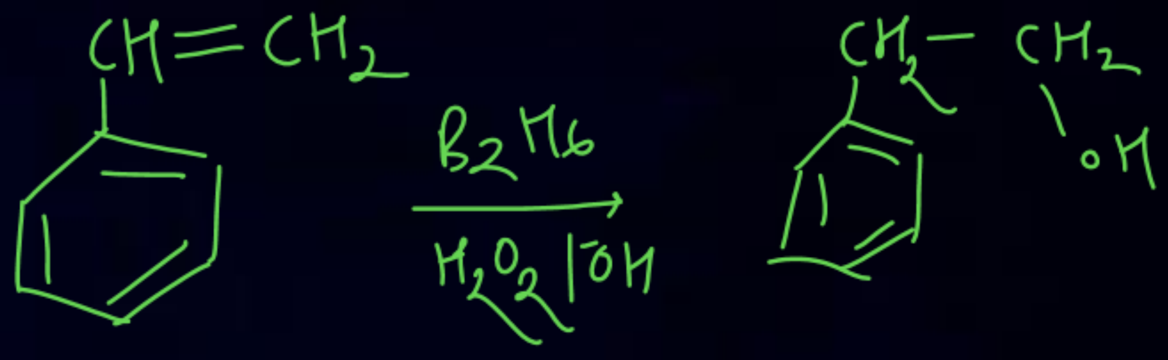
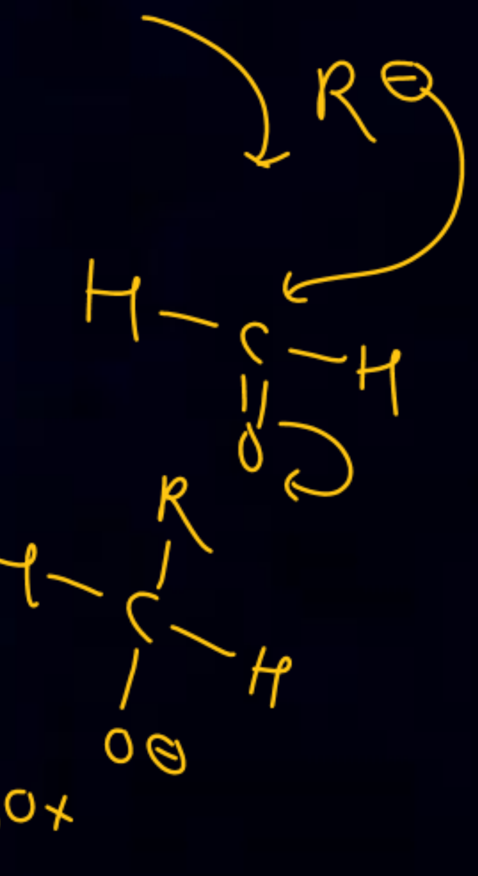
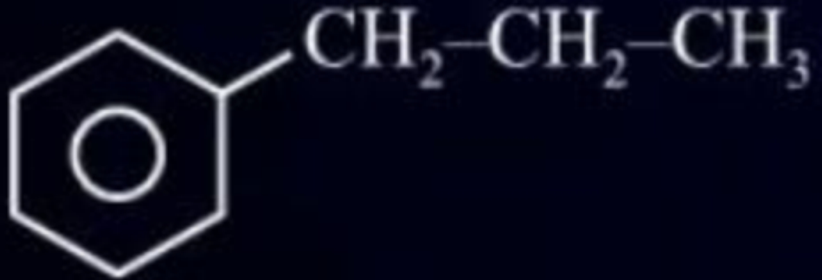
The final product of the reactions sequence.

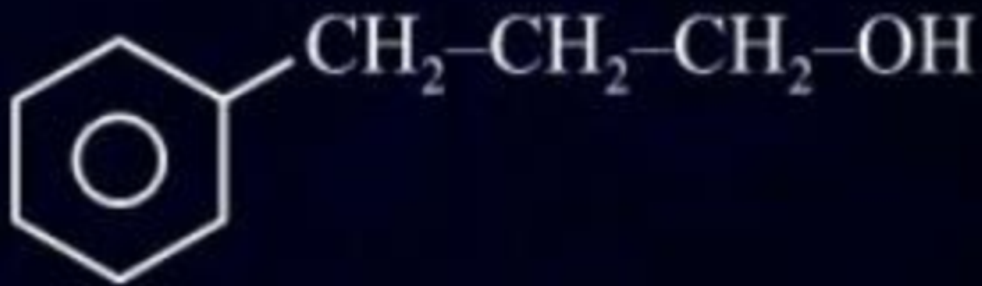
$$Ph-CH_2-CH=CH_2 \xrightarrow[\text{(ii) } PCl_5 \text{ (iii) } Mg/DE \text{ (iv) } H_2O]{\text{(i) HBO}} \text{Final Product}$$

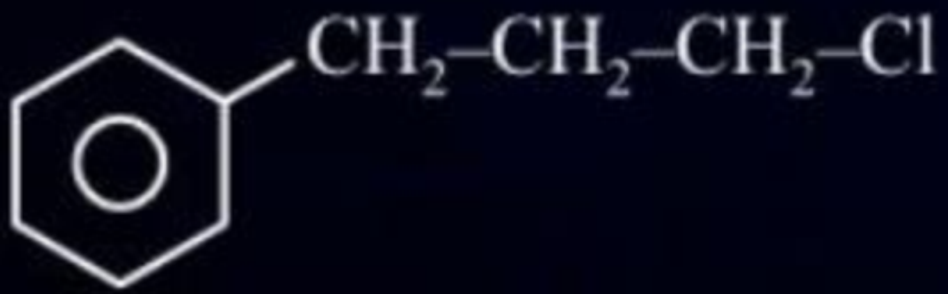


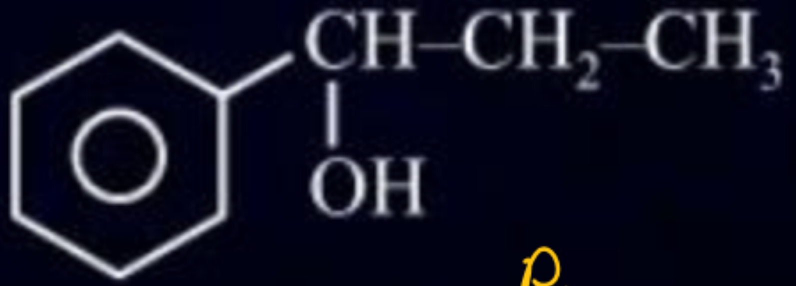




(A) 

(B) 

(C) 

(D) 

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Identify B formed in this reaction sequence.

$$Cl-(CH_2)_4-Cl \xrightarrow{\text{excess } NH_3} A \xrightarrow{NaOH} B + H_2O + NaCl$$

$Cl^- \overset{+}{N}H_3 - CH_2 - CH_2 - CH_2 - CH_2 - \overset{+}{N}H_3 \, Cl^-$

(A) $Cl^- \overset{+}{N}H_3 - (CH_2)_4 - \overset{+}{N}H_3 Cl^-$

(B) 

(C) $NH_2 - (CH_2)_4 - NH_2$ ✓

(D) 

Which of the following will not give SN^1.

(A) $Ph-CH_2-Cl$

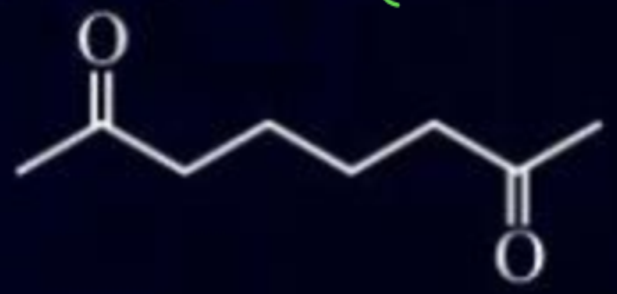
(B) $CH_2=CH-CH_2-Cl$

(C) $(H_3C)C-Cl$

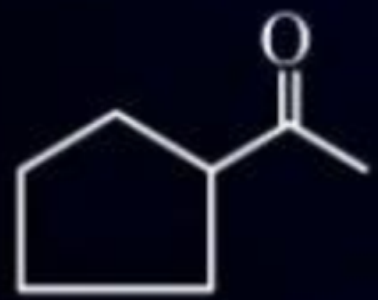
(D) $CH_3-CH=CH-Cl$

Consider the following sequence of reactions.

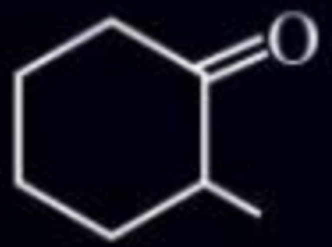
$$X \xrightarrow[\text{(2) } H_2O]{\text{(1) } CH_3MgBr} Y \xrightarrow[\Delta]{H_2SO_4} Z \xrightarrow[Zn/H_2O]{O_3}$$



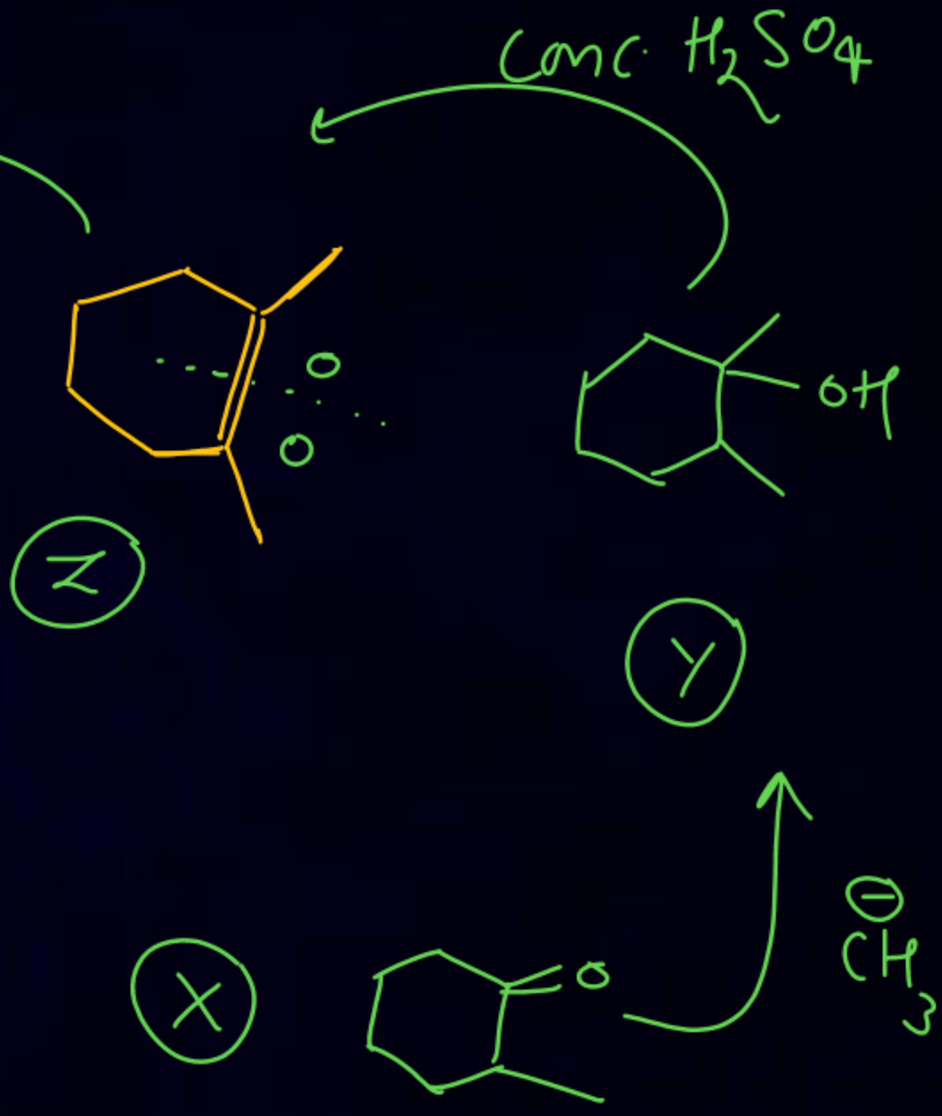
The compound (X) cannot be:

(A) 

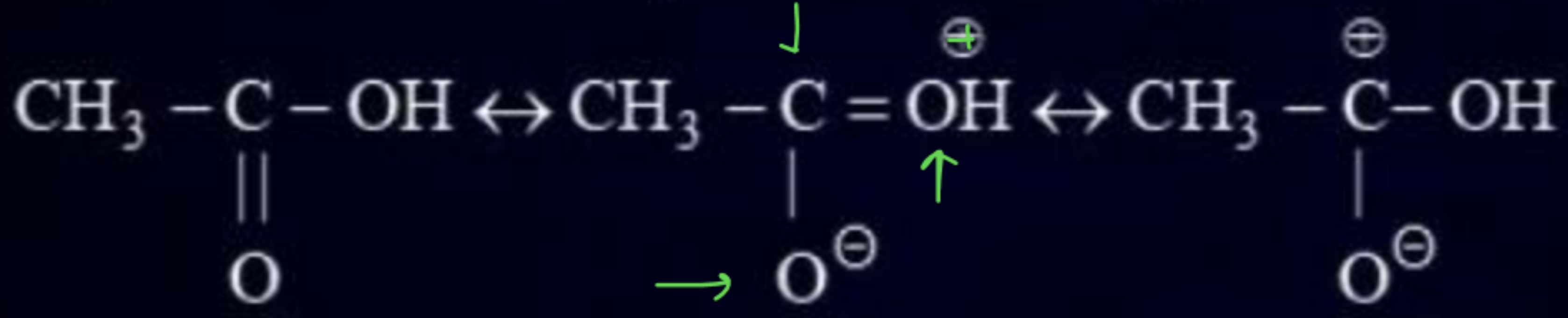
(B) 

(C) 

(D) 



Compare the stability of resonating structures.



(I) (II) (III)

A. I > II > III

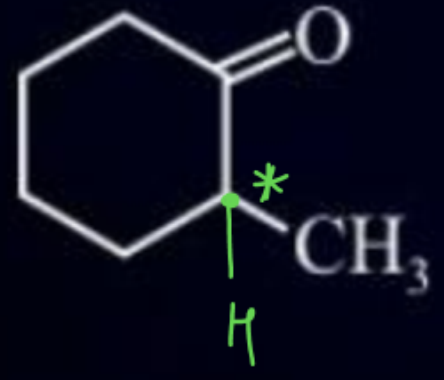
B. III > II > I

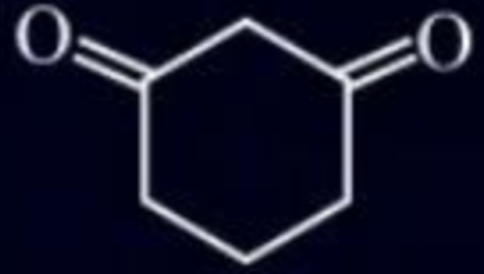
C. I > III > II

D. II > I > III

I > II > III

How many compound(s) given below have chiral carbon? (2)

(A) 

(B) 

(C) $CH_3-CH_2-\underset{}{\overset{I}{\overset{|}{C}}}H-CH_2-CH_3$

(D) $CH_3-CH_2-\underset{H}{\underset{|}{\overset{OH}{\overset{|}{C}}}}-COOH$

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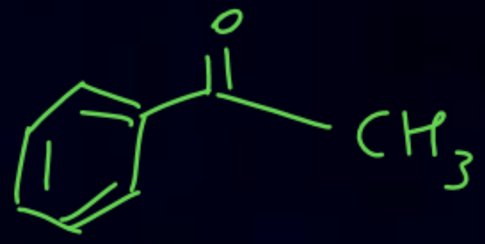
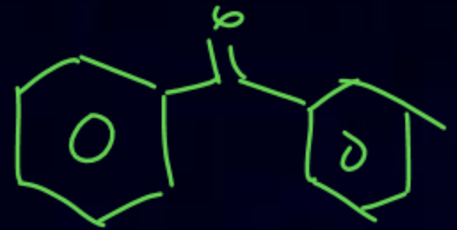
The reagent which can be used to distinguish acetophenone from benzophenone is



(A) 2, 4-dinitrophenylhydrazine



(B) Aqueous solution of $NaHSO_3$

(C) Benedict reagent

(D) I_2 and Na_2CO_3 ✓

I_2 | NaOH

The technique used for purification of steam volatile water immiscible substance is:

(A) Steam distillation

(B) Simple distillation

(C) Fractional distillation

(D) Distillation under reduce pressure

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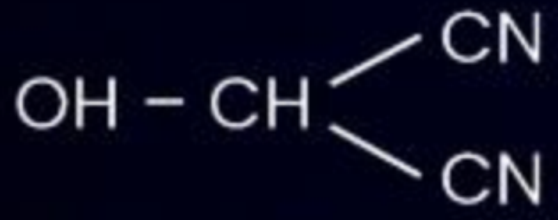
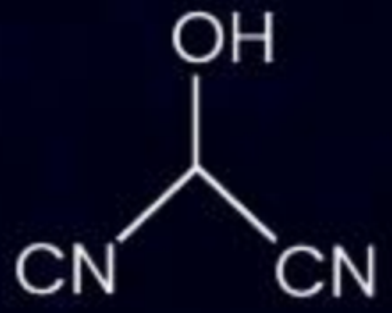
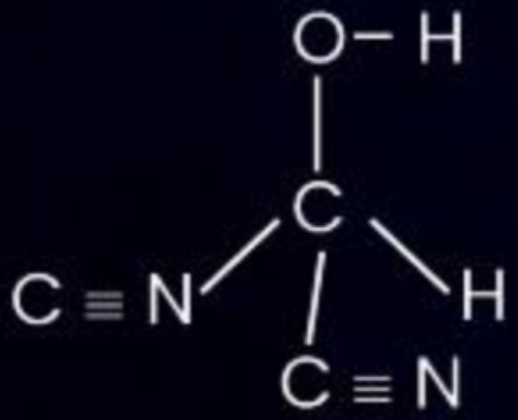
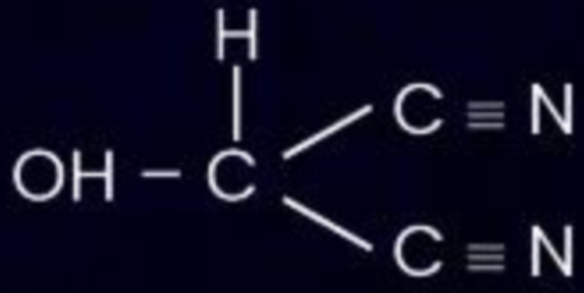
What is the bond line structure of $(OH)CH(CN)_2$

(A) 

(B) 

E/M

(C) 

(D) 

PHYSICAL CHEMISTRY

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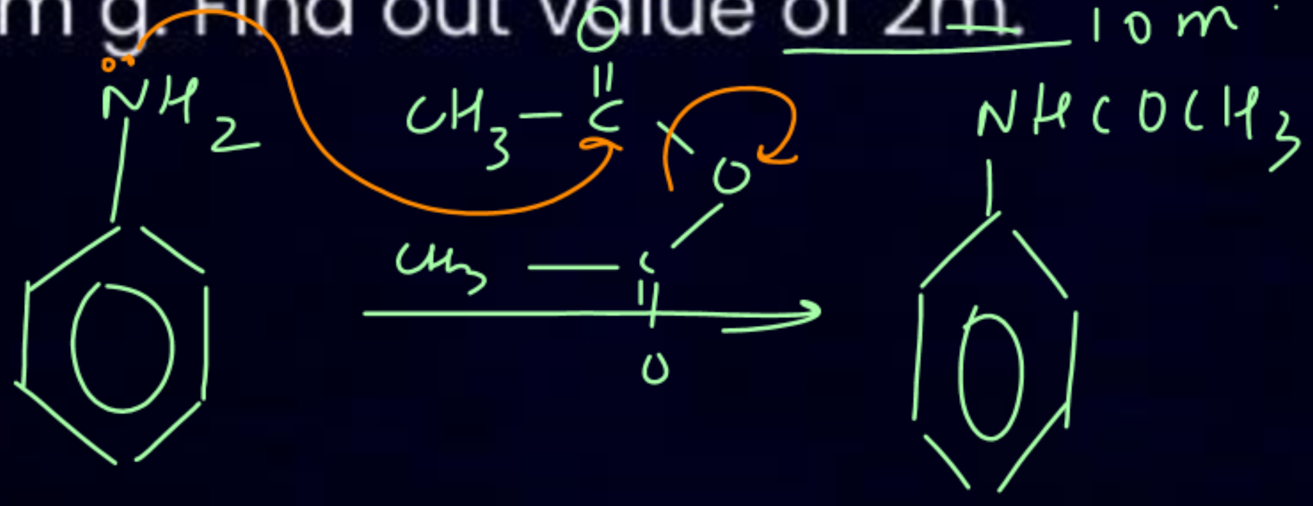
When 9.3 g of Aniline is reacted with acetic anhydride, mass of acetanilide obtained is m g. Find out value of 2m. 10 m.



$10 \times 13.5 = 135\ g$

wt.

$\frac{9.3\,g}{93} = 0.1\ mol \longrightarrow 0.1\ mol \longrightarrow 0.1 \times 135 = 13.5\ gm$

$$-OH \longrightarrow -O-\overset{O}{\overset{\|}{C}}-CH_3$$

wt change = 42 g.

$$-NH_2 \longrightarrow -NH-\overset{O}{\overset{\|}{C}}-CH_3$$

wt change = 42 g.

42.

The quantity which changes with temperature is

(A) Mass percentage

(B) Molality

(C) Molarity

(D) Mole fraction

Those conc. terms which are vol. dependent are temp. dependent.

Which of the following can not act as an oxidising agent?

जो reduce होगा ⟶ O.A.

(A) $\overset{+6}{S}O_4^{2-}$

(B) N^{-3}

(C) $\overset{+5}{Br}O_3^{\ominus}$

(D) $\overset{+7}{Mn}O_4^{\ominus}$

The time taken to complete 99.9% of a first order reaction is 'x' times half life. Find x .... 10 $\times t_{1/2}$

$t_{99.9\%}$ = time taken to complete 99.9% reaction

left amount = 0.1%

$$t_{99.9\%} = \frac{2.303}{k}\log\frac{A_0}{(A_0/1000)} = \frac{2.303}{k}\log 1000$$

$$= \frac{2.303}{k}\times 3 = \frac{6.909}{k}$$

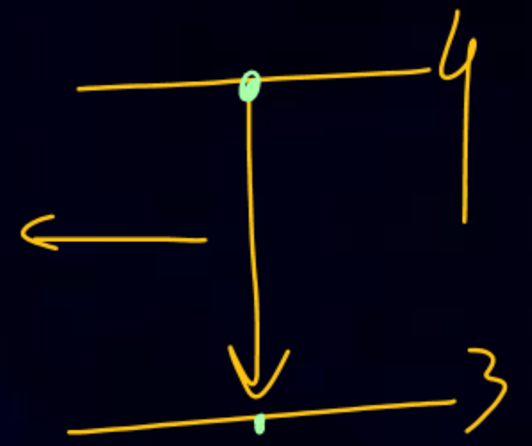
$$10\left(\frac{0.693}{k}\right) \rightarrow t_{1/2}$$

longest line = longest W.L

If longest wavelength for Paschen Series in H-atom is α. Find $\alpha/7R$.

$n_1 = 3$; $n_2 = 4 \ldots \infty$

$\lambda_{max} = E_{min}$



$$\frac{1}{\lambda} = R(1)^2\left[\frac{1}{3^2} - \frac{1}{4^2}\right]$$

$$\frac{1}{\lambda} = \frac{R \times 7}{144}$$

$$\lambda = \frac{144}{7R} = \frac{\alpha}{7R} \Rightarrow \boxed{\alpha = 144}$$

For hydrogen electrode the reduction potential at pH = 3 is

(A) −0.18 V

(B) −1.8 V

(C) −0.8 V

(D) −1.2 V

$2H^+ + 2e^- \longrightarrow H_2$

$E = E^0 - \frac{0.0591}{2} \log \frac{1}{[H^+]^2}$

$= -0.0591 \times \log 10^3$

$= -0.18\,V$

Nernst Eq^n

$pH = 3 \rightarrow 10^{-3}\,M$

$pH = -\log[H^+]$

$[H^+] = 10^{-3}\,M$

Total translational kinetic energy in calorie of 1 mol of oxygen at 27°C.

$$\text{Total K.E} = \frac{3}{2} \times R \times T = \frac{3}{2} \times 2 \times 300 = 900 \text{ cal.}$$

(A) 900 ✓

(B) 1200

(C) 1600

(D) 600

The threshold frequency of metal with work function 6.63 eV is $x \times 10^{14}\ \text{sec}^{-1}$ $\{h = 6.63 \times 10^{-34}\ \text{J sec}\}$, then find '$x$'?

$1\ eV = 1.6 \times 10^{-19}\ J$

$W = h\nu_0$

$6.63 \times 1.6 \times 10^{-19} = 6.63 \times 10^{-34} \times \nu_0$

$\nu_0 = 1.6 \times 10^{15}$

$= 16 \times 10^{14} = x \times 10^{14}$

$x = 16$

The volume of NaOH in dm^3 of 3 M NaOH solution contain 84 g of NaOH.

(A) $\frac{28}{40}$

(B) $\frac{40}{28}$

(C) $\frac{84}{120}$ ✓

(D) $\frac{48}{84}$

$$\text{Molarity} = \frac{\text{moles of solute}}{\text{vol. of solut}^n \text{ in lt}}$$

$$3 = \frac{\frac{84}{40}}{V}$$

$$V = \frac{84}{120}\,\text{lt} = \frac{84}{120}\,dm^3$$

$\Delta G^\circ = -2.303 RT \log K$

$\Delta H^\circ = 77.2$ kJ , $\Delta S^\circ = 122$ J/mol·K T = 300 K

$\log K = ?$

$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ = -2.303 RT \log K$

$= 77.2 - 300\left(\frac{122}{1000}\right) = -2.303 \times 8.314 \times 300 \log K$

$\log K = -7.07$

Mathematics

Coefficient of x^{2012} in $(1 - x)^{2008}(1 + x + x^2)^{2007}$

(A) 0

(B) 1

(C) 2

(D) 3

$\lim_{x \to 0} \frac{3 - a\sin x - b\cos x - \log_e(1+x)}{3\tan^2 x}$ is non zero finite find 2b - a

(A) 2

(B) 5

(C) 7

(D) 9

$\frac{dy}{dx} = \frac{(x+y-2)}{x-y}$ .... find solution of this differential equation.

If $\tan^{-1} x + \tan^{-1} 2x = \frac{\pi}{4}$, then find number of solutions.

If the mean of 15 observations are 12 and S.D is 3 But the replace of 12 write 10 then the new mean is μ and varies is σ^2 then what is the value of 15 $(\mu + \mu^2 + \sigma^2)$

Evaluate: $\int \frac{\left(x^2-\frac{1}{x^4}\right)dx}{\tan^{-1}\left(x^3+\frac{1}{x^3}\right)\left(1+\left(x^3+\frac{1}{x^3}\right)^2\right)}$

(A) $\frac{1}{3}\log\left[\tan^{-1}\left(x^3+\frac{1}{x^3}\right)\right]+C$

(B) $\frac{1}{2}\log\left[\tan^{-1}\left(x^3+\frac{1}{x^3}\right)\right]+C$

(C) $\frac{1}{2}\log\left[\tan^{-1}\left(x^3-\frac{1}{x^3}\right)\right]-C$

(D) None of these

Determinant, interval of a. Angle bisector of the given points with same z coordinate. $\tan^{-1}x + \tan^{-2}x = 1$, no of solutions for positive x. Image of a point wrt x line and which point from give passes through. Summation $k/2^k$ from 1 to n where n was found from another solution.

The position vector of the vertices A, B, C of a triangle arc $2\hat{i}+3\hat{j}+3\hat{k}$, $2\hat{i}-2\hat{j}+3\hat{k}$, $-\hat{i}+\hat{j}+3\hat{k}$ respective dy. Let l denotes the length of the angle bisector AD of $\angle BAC$ where D is on the line segment BC, then $2l^2$ equals.

If 20^{th} term from the end of the progression

$20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \ldots, -129\frac{1}{4}$ is

(A) −120

(B) −115

(C) −125

(D) −110

Difference of subsets of 2 finite sets with m & n elements, is 56 then find distance between (m, n) & (−2, −3).

(A) 10

(B) 16

(C) 14

(D) None of these

The integral $\int \frac{(x^8-x^2)}{(x^{12}+3x^6+1)\tan^{-1}\left(x^3+\frac{1}{x^3}\right)}dx$ is equal to:

(A) $\frac{1}{3}\ln\left|\left(\tan^{-1}\left(x^3+\frac{1}{x^3}\right)\right)\right|+C$

(B) $\ln\left|\left(\tan^{-1}\left(x^3+\frac{1}{x^3}\right)\right)\right|+C$

(C) $\frac{1}{6}\ln\left|\left(\tan^{-1}\left(x^3+\frac{1}{x^3}\right)\right)\right|+C$

(D) $\frac{1}{9}\ln\left|\left(\tan^{-1}\left(x^3+\frac{1}{x^3}\right)\right)\right|+C$

If $2\tan^2\theta - 5\sec\theta = 1$ has exactly 7 solutions in $\left[0, \frac{n\pi}{2}\right]$ for least value of $n \in N$, then $\sum_{k=1}^{n} \frac{k}{2^n}$ is equal to __________.

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

(B) $\frac{91}{2^{13}}$

(C) $\frac{7}{2^7}$

(D) $\frac{11}{2^{12}}$

If $\frac{dy}{dx} = \frac{x+y-2}{x-y}$, and $y(0) = 2$, find $y(2)$.

A 0

B 2

C e

D e^2

An urn contains 6 white and 9 black balls. Two successive draws of 4 balls are made without replacement. The probability that the first draw gives all white balls and second draw gives all black balls is:

(A) $\frac{2}{335}$

(B) $\frac{1}{495}$

(C) $\frac{5}{812}$

(D) $\frac{3}{715}$

If α, β are the roots of $x^2 - x + 1 = 0$ then the value of

$Sn = 2023\alpha^n + 2024\beta^n$ is

$2\hat{\imath}+2\hat{\jmath}+\hat{k}, \hat{\imath}+2\hat{\jmath}+2\hat{k}$ and $2\hat{\imath}+\hat{\jmath}+2\hat{k}$. let l_1, l_2 and l_3 be lengths of Perpendicular drawn center of the triangle on the sides AB, BC and CA respectively then $l_1^2+l_2^2+l_3^2$.

Let the image of the point $(1, a, 7)$ in the line $\frac{b}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ be the point (α, β, γ) then which one of the following points lie on the line passing through (α, β, γ) then which making angles $\frac{\pi}{3}$ & $\frac{3\pi}{4}$ with y-axis and z axis respectively and an acute angle with x −axis?

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

(B) $(3,4,3-2\sqrt{2})$

(C) $(3,-4,3+2\sqrt{2})$

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

A is the area of region $0 \le y \le \min(2x, 6x - x^2)$, then find 12A.

(A) 304

(B) 302

(C) 288

(D) 312

Equation of tangent to circle $(x-\alpha)^2+(y-\beta)^2=50$ is $x+y=0$.
If distance of point of contact from origin is $4\sqrt{2}$ find $(\alpha+\beta)^2$.

The point P on the parabola $y^2 = 4ax$ for which $|PR - PQ|$ is maximum, where $R(-a, 0)$, $Q(0, a)$ is

(A) $(a, 2a)$

(B) $(a, -2a)$

(C) $(4a, 4a)$

(D) $(4a, -4a)$

There are four boxes A_1, A_2, A_3 and A_4. Box A_i has **i** cards and on each card a number is printed, the numbers are from 1 to **i**. A box is selected randomly, the probability of selection of box A_i is $\frac{i}{10}$ and then a card is drawn. Let E_i represents the event that a card with number 'i' is drawn. $P(A_3/E_2)$ is equal to:

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

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

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

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

If $\frac{dy}{dx} + xy = x^3y^3, y(0) = 1$, then $y(7)$ equals

(A) 1/50

(B) 50

(C) $1/\sqrt{50}$

(D) $\sqrt{50}$

If $f(x) = \max\left\{\sin x, \cos x, \frac{1}{2}\right\}$, then the area of the region bounded by the curves $y = f(x)$, x-axis, y-axis and $x = 2\pi$ is

(A) $\left(\frac{5\pi}{12} + 3\right)$ sq. units

(B) $\left(\frac{5\pi}{12} + \sqrt{2}\right)$ sq. units

(C) $\left(\frac{5\pi}{12} + \sqrt{3}\right)$ sq. units

(D) $\left(\frac{5\pi}{12} + \sqrt{2} + \sqrt{3}\right)$ sq. units

A circle cuts two perpendicular lines so that intercept on each of the line is of given length.
The locus of the centre of circle

(A) a hyperbola of eccentricity 5/4

(B) a hyperbola of eccentricity $\sqrt{2}$

(C) an ellipse of eccentricity 4/5

(D) a parabola

If $\lim_{x \to \frac{1}{\sqrt{2}}} \frac{\sin(\cos^{-1}x) - x}{1 - \tan(\cos^{-1}x)} = \frac{-k}{\sqrt{2}}$, then the value of k is

(A) 2

(B) 1

(C) 1/2

(D) 1/4

If $\int \frac{\sin 2x}{\sin 3x \sin 5x} dx = \frac{1}{p} \log_e |\sin 3x| - \frac{1}{q} \log_e |\sin 5x| + C$, then $|p - q|$ is equal to (where C is constant of integration)

(A) 1

(B) 2

(C) −1

(D) −2

If $a_n = \int_0^{\pi/2} \frac{\sin^2 nx}{\sin x} dx$, then $a_2 - a_1$, $a_3 - a_2$, $a_4 - a_3$ are in

(A) A.P

(B) G.P

(C) H.P

(D) A.G.P

If the point $(a, a^2 + 1)$ lies between the lines joining the points $(-3, 10)$, $(-1, 2)$ and $(0, 1)$, $\left(\frac{1}{3}, \frac{10}{9}\right)$, then find the values of a.

(A) $(-\infty, -3) \cup (-1, 0) \cup \left(\frac{1}{3}, \infty\right)$

(B) $(-\infty, -3) \cup (-1, 0)$

(C) $(0, 1) \cup \left(\frac{1}{3}, \infty\right)$

(D) None of these

Solve the differential equation $(x^2 - 4)dy - (y^2 - 3y)\,dx = 0$

A is a 2×2 matrix, I is 2×2 identity matrix. $|A - xI| = 0$ has the roots $-1, 3$. Then the sum of diagonal elements of A^2.

$0 < a < 1, \int_0^{\pi} \frac{dx}{1-2a\cos x+a^2}$ = value of the integral

(A) $\frac{\pi^2}{\pi + a^2}$

(B) $\frac{\pi}{1 + a^2}$

(C) $\frac{\pi^2}{\pi - a^2}$

(D) $\frac{\pi}{1 - a^2}$

For $x \in (0, 3)$

$g(x) = 3f\left(\frac{x}{3}\right) + f(3 - x)$ and $f''(x) > 0 \ \forall x \in (0,3)$,

If $g(x)$ is increasing in $(\alpha, 3)$ and decreasing in $(0, \alpha)$ then find α.

Let $f: R - \left\{-\frac{1}{2}\right\} \to R$ and $g: R - \left\{-\frac{5}{2}\right\} \to R$ be defined as $f(x) = \frac{2x+3}{2x+1}$ and $g(x) = \frac{|x|+1}{2x+5}$ then the domain of the function f(g(x)) is:

(A) R

(B) $R - \left\{-\frac{5}{2}\right\}$

(C) $R - \left\{-\frac{1}{2}, -\frac{5}{2}\right\}$

(D) $R - \left\{-\frac{1}{2}\right\}$

Considering the principal values of inverse trigonometric functions the positive real values of x satisfying $\tan^{-1} x + \tan^{-1}(2x) = \frac{\pi}{4}$ is:

(A) $\frac{\sqrt{5}-1}{2}$

(B) $\frac{\sqrt{17}+3}{4}$

(C) $\frac{\sqrt{17}-3}{4}$

(D) $\frac{\sqrt{5}+1}{2}$

Find the area bounded by:

$0 \le y \le \min\{2x, 6x - x^2\}$

THANK YOU