#1611185
**Topic:** Methods of preparation of amines

Which of the following amine will be prepared by Gabriel phthalimide reaction?

A	n-Butylamine

B	Triethylamine

C	neo-Pentylamine

D	tert-Butylamine

Solution

Gabriel phthalimide reaction is used to prepare primary unhindered amine only. because in Gabriel phthalimide reaction no other place for nitrogen, therefor it attack at termina

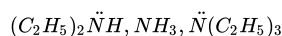position only and after hydrolysis it give primary amine i.e n-Butylamine.
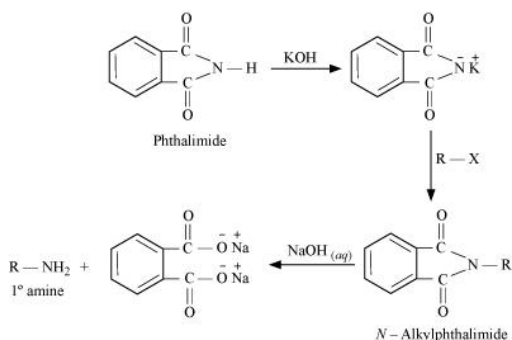
#1611186
Topic: Disaccharides and polysaccharides

Reaction of dilute HCl with Maltose gives:

A	D-glucose

B	D-fructose

C	D-glucose and D-fructose

D	D-galactose

#1611189
Topic: Chemical reactions of amines

The correct order of K_b value of following is:

$(C_2H_5)_2\ddot{N}H, NH_3, \ddot{N}(C_2H_5)_3$

A	$1 > 2 > 3$

B	$1 > 3 > 2$

C	$3 > 2 > 1$

D	$3 > 1 > 2$

Solution

$+I$ effect is maximum in secondary amine and minimum in primary amine.

Thus the correct order of K_b will be

$(C_2H_5)_2\ddot{N}H > \ddot{N}(C_2H_5)_3 > NH_3$
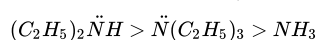
#1611191
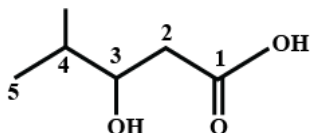**Topic:** Introduction and nomenclature of carboxylic acids
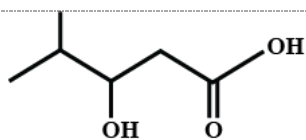
Write IUPAC name of the following compound.

A   3-Hydroxy-2-methylpentanoic acid

B   4-Methyl-3-hydroxypentanoic acid

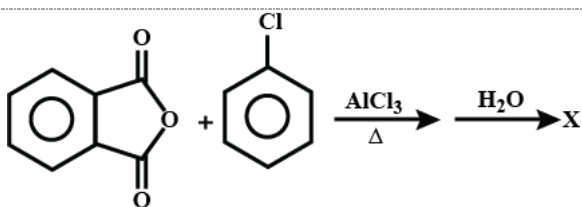C   3-hydroxy-4-methylpentanoic acid

D   2-Methyl-2-hydroxypentanoic acid

Solution

3-Hydroxy-4-methylpentanoic acid

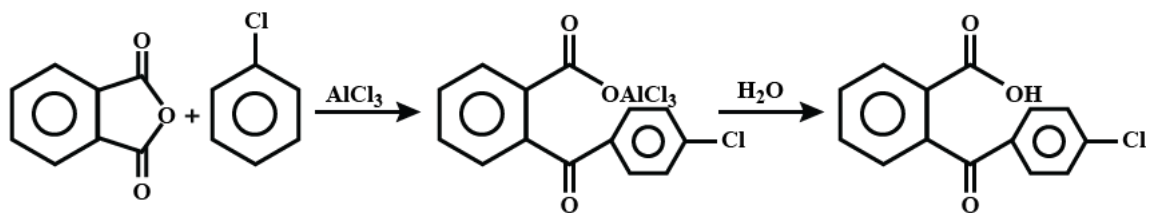

#1611196

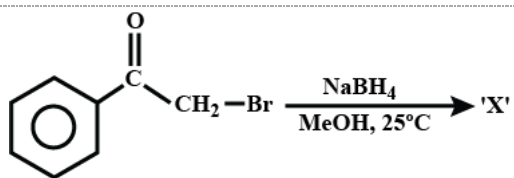**Topic:** Types of organic reactions

Compound 'X' will be:

A

B

C
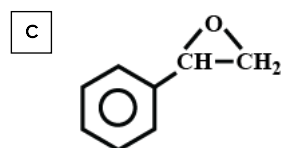

D

Solution

#1611199
Topic: Chemical properties of aldehydes and ketones

X will be:

A

B

C

D
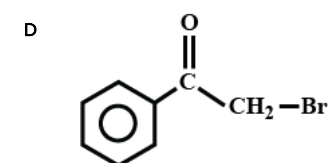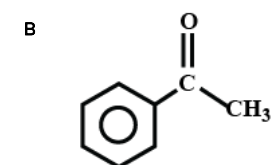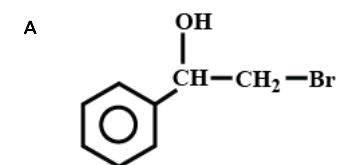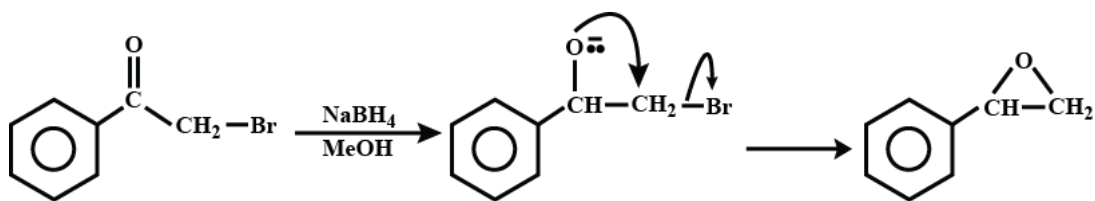
Solution

#1611202
Topic: Diazonium salts

What will be the product of the given reaction?

A

B

C
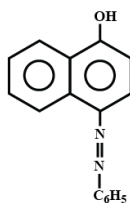
D
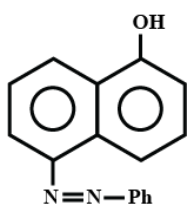
Solution

Diazo coupling will take place from the least hindered (ortho, para) position of most activated phenolic ring.
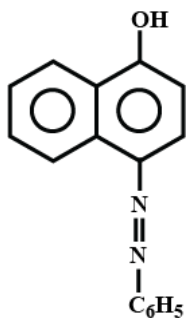
#1611204

Topic: Types of organic reactions

Find the product of the given reaction.

A

B

C

Structure with OCH_3 and CH_2-CH_2-Br groups on benzene ring

D

Structure with OH and CH_2-CH_2-Br groups on benzene ring

Solution

Reaction mechanism showing OCH₃ substituted benzene with CH=CH₂, reacting through H—Br, Br, H—Br steps.

Final product: benzene ring with OH and $Br-CH-CH_3$ groups $+ CH_3-Br$
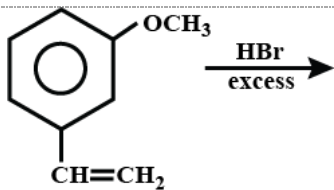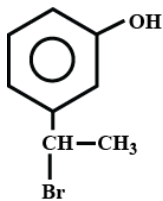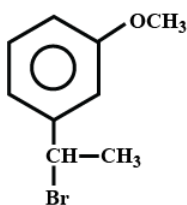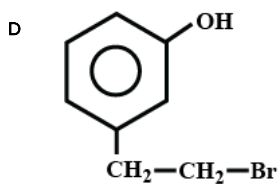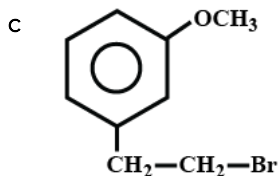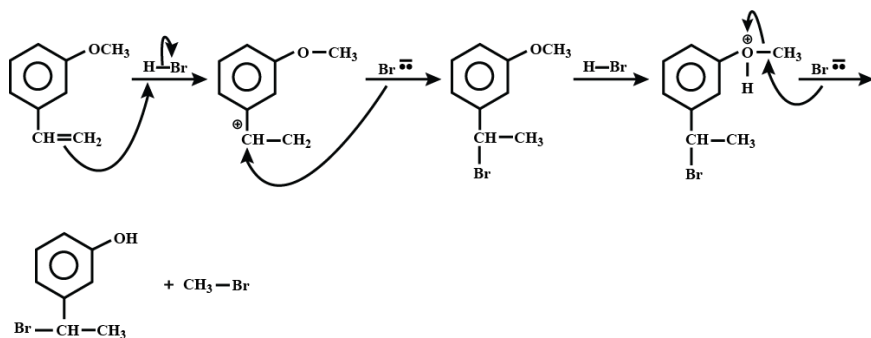
#1611206
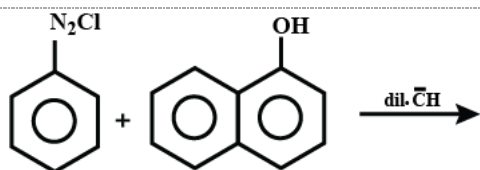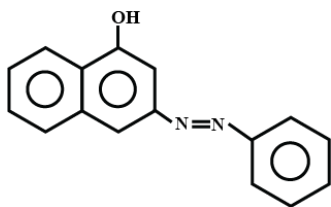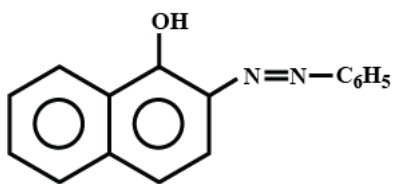
Topic: Chemical properties of aldehydes and ketones

Find the compound 'X' which give following test.

Neutral $FeCl_3 \to -ve$

Fehling solution $\to -ve$

Iodoform reaction $\to +ve$

Grignard reagent $\to +ve$

A

Benzene ring with OH, $CH-CH_3$ and OCH_3 groups

B

Benzene ring with OH, $CH-CH_3$ and OH groups

C

Benzene ring with OH, $C-C_2H_5$ (double bond) and OCH_3 groups

D

Benzene ring with OH, $C-C_2H_5$ (double bond) and OH groups
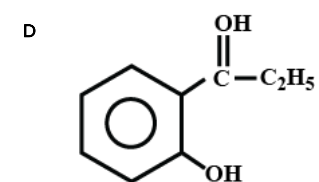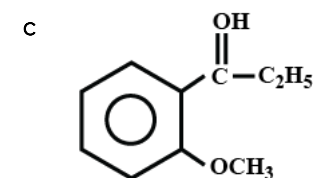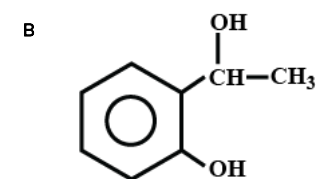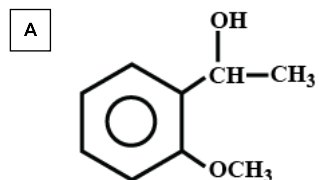
Solution

Neutral $FeCl_3 \rightarrow -ve \Rightarrow$ phenol is absent.

Fehling solution $\rightarrow -ve \Rightarrow -CHO$ is absent.

Iodofoem reaction $\rightarrow +ve \Rightarrow -COCH_3$ or $-CH(OH)-CH_3$ is present.

Grignard reagent $\rightarrow +ve \Rightarrow$ Electrophilic centre of acidic H is present.

obeys all above statements.
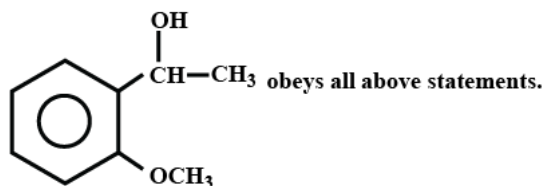
#1611208

Topic: Important alcohols and phenols
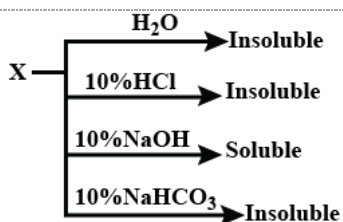
Identify the compound 'X'.

A   Toluidine

B   Benzamide

C   Para-Cresol

D   Oleic acid

Solution

Both Para-Cresol and Oleic acid form salt with $10\% NaOH$, but Para-Cresol salt is soluble whereas Oleic acid salt is insoluble due to very long unsaturated carbon chain.

#1611212

Topic: First law of thermodynamics

Which of the following is not correct for an ideal gas as per first low of thermodynamics?

A   Adiabatic process $\Delta U = -w$

B   Isothermal process $q = -w$

C   Cyclic process $q = -w$

D   Isochoric process $\Delta U = q$

Solution

From FLOT $\Delta U = q + w$

for adiabatic process $q = 0$

$\therefore \Delta U = w$

#1611213

Topic: Adsorption
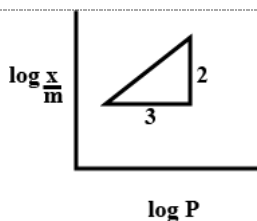
In Freundlich isotherm, $\dfrac{x}{m} \propto P^a$. Find the value of a from the following graph.

A $\dfrac{2}{3}$

B $\dfrac{1}{3}$

C $\dfrac{3}{2}$

D 1

Solution

From Freudlich isotherm $\log \dfrac{x}{m} = \log k + \dfrac{1}{n}\log p$

slope of curve is $\dfrac{1}{n} = a = \dfrac{2}{3}$

#1611216

Topic: Vapour Pressure of Liquid Solutions and Raoult's Law

In a mixture of A and B, having vapour pressure of pure A and pure B as $400\,mm\,Hg$ and $600\,mm\,Hg$ respectively, mole fraction of B in liquid phases is 0.5. Calculate total vapour pressure and mole fraction of A and B in vapour phases.

A $500, 0.4, 0.6$

B $500, 0.5, 0.5$

C $450, 0.4, 0.6$

D $450, 0.5, 0.5$

Solution

$P_T = X_A P_{A^o} + X_B P_{B^o}$

$= 0.5 \times 400 + 0.5 \times 600$

$= 500\,nm$ of Hg

$\dfrac{1}{P_T} = \dfrac{y_A}{P_A^o} + \dfrac{1 - y_B}{P_B^o}$

$y_A = 0.6\ \&\ y_B = 1 - 0.6 = 0.4$

#1611219

Topic: Quantum numbers

Arrange the following set of quantum numbers having highest energy of an electron.

(p) $n = 4 \quad l = 1 \quad m = +1 \quad s = +\dfrac{1}{2}$

(q) $n = 4 \quad l = 2 \quad m = -1 \quad s = -\dfrac{1}{2}$

(r) $n = 3 \quad l = 2 \quad m = 0 \quad s = +\dfrac{1}{2}$

(s) $n = 3 \quad l = 1 \quad m = +1 \quad s = -\dfrac{1}{2}$

A $q > r > p > s$

B $q > p > r > s$

C $s > p > r > q$

D $s > r > p > q$

Solution

We know that n is principle quantum number and l is an azimuthal quantum number.

Also, $l = n - 1$

The set of quantum number which have highest value of $n + l$ will have the highest energy and vice versa.

#1611225

Topic: Calculation of number of particles per unit cell of a cubic crystal system

A forms ccp lattice, B occupies half of the octahedral voids and 'O' occupy all the tetrahedral voids. Calculate formula.

A $A_2 BO_4$

B ABO_4

C $A_2 B_2 O$

D A_2B_3O

Solution

Effective number of $A = 4$ & effective number of $B = 4 \times \dfrac{1}{4} = 2$ & effective number of $O = 8$ & formula is $A_4B_2O_B$ or A_2BO_4

#1611227

Topic: Boron and aluminium

B_2H_6 reacts with O_2 and H_2O respectively to form:

| A | B_2O_3, H_3BO_3 |

B B_2O_3, BH_4^-

C HBO_2, H_3BO_3

D H_3BO_3, HBO_2

Solution

$B_2H_6 + 3O_2 \rightarrow B_2O_3 + 3H_2O$

$B_2H_6 + 6H_2O \rightarrow 2H_3BO_3 + 6H_2$
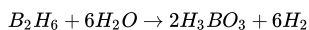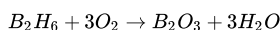
#1611231

Topic: Concentrations

Solution of $100ml$ water contains $0.73g$ of $Mg(HCO_3)_2$ and $0.81g$ of $Ca(HCO_3)_2$. Calculate the hardness in terms of ppm of $CaCO_3$.

A $10^2 ppm$

| B | $10^4 ppm$ |

C $5 \times 10^3 ppm$

D $10^3 ppm$

Solution

$$ppm \text{ of } CaCO_3 = \dfrac{\left(\dfrac{0.73}{146} + \dfrac{0.81}{162} \right) \times 100}{100} \times 10^6 = 10^4 ppm$$

#1611234

Topic: Solubility product and common ion effect

For $Zr_3(PO_4)_4$ the solubility product is K_{sp} and solubility is S. Find the correct relation.

| A | $S = \left(\dfrac{K_{sp}}{6912} \right)^{1/7}$ |

B $S = \left(\dfrac{K_{sp}}{216} \right)^{1/7}$

C $S = \left(\dfrac{K_{sp}}{216} \right)^{1/8}$

D $S = \left(\dfrac{K_{sp}}{912} \right)^{1/3}$

Solution

$Zr_3(PO_4)_4 \rightleftharpoons \underset{3s}{3Zr^{4+}} + \underset{4s}{4PO_4^{3-}}$
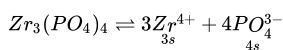
$K_{sp} = (3s)^3 (4s)^4$

$= 27 \times 256 s^7$

$= 6912 s^7$

$S = \left(\dfrac{K_{sp}}{6912} \right)^{1/7}$

#1611247

Topic: Crystal field theory

Given complexes are low spin complexes,

$[V(CN)_6]^{4-}$

$[Cr(NH_3)_6]^{2+}$

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

$[Fe(CN)_6]^{4-}$

then order of magnetic moment (μ) for $V^{2+}, Fe^{2+}, Cr^{+3}, Ru^{3+}$ is:

A $V^{2+} > Cr^{2+} > Fe^{2+} > Ru^{3+}$

B $Fe^{2+} > V^{2+} > Cr^{+2} > Ru^{3+}$

C $V^{2+} > Cr^{2+} > Ru^{3+} > Fe^{2+}$

D $Fe^{2+} > Cr^{3+} > V^{2+} > Ru^{3+}$

Solution

The magnetic moment is directly proportional to the number of unparied electrons and it is given by formula:

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

Here all ligands are strong field ligands thus pairing of unpaired electron takes place.

Here for $[V(CN)]^{4-}$, V shows $+2$ oxidation state,

$\therefore V^{2+} = [Ar]3d^3$ (3 unpaired electrons)

For $[Cr(NH_3)_6]^{2+}$, Cr shows $+2$ oxidation state

$\therefore Cr^{2+} = [Ar]3d^4$ (2 unpaired electrons)

For $[Ru(NH_3)_6]^{3+}$, Ru^{3+} shows $+3$ oxidation state

$\therefore Ru^{3+} = [Kr]4d^5$,(1 unpaired electrons)

Similarly, $[Fe(CN)_6]^{4-}$ will have 0 unpaired electrons.

#1611258
Topic: Electrode potential

Given : $E^o_{S_2O_8^{2-}/SO_4^{2-}} = 2.05V$

$E^o_{Br_2/Br^-} = 1.40V$

$E^o_{Au^{3+}/Au} = 1.10V$

$E^o_{O_2/H_2O} = 1.20V$

Which of the following is the strongest oxidizing agent?

A $S_2O_8^{2-}$

B Br_2

C Au^{+3}

D O_2
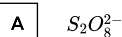
Solution

Strongest oxidizing agent has highest value of SRP

#1611269
Topic: Ozone

Assertion

Ozone is getting depleted due to CFC_s

Reason

With the depletion of ozone layer more UV radiation filters into troposphere

A   Both Assertion and Reason are correct and Reason is the correct explanation for Assertion

B   Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion

C   Assertion is correct but Reason is incorrect

D   Assertion is incorrect but Reason is correct

Solution

Ozone layer is depleted due to released of chloroflurocarbons $(CFCs)$

$$CF_2Cl_2(g) \xrightarrow{UV} \overset{\bullet}{Cl}(g) + F_2Cl(g)$$
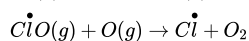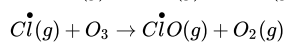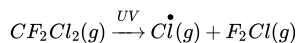
$$\overset{\bullet}{Cl}(g) + O_3 \rightarrow \overset{\bullet}{Cl}O(g) + O_2(g)$$

$$\overset{\bullet}{Cl}O(g) + O(g) \rightarrow \overset{\bullet}{Cl} + O_2$$

Due to depletion of ozone layer, more UV radiation filters into troposphere.

#1611275

Topic: Alkali metals

In which of the following order of hydration energy correct?

A	$Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$

B $Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$

C $Li^+ > Na^+ > K^+ > Cs^+ > Rb^+$

D $Li^+ < Na^+ < K^+ < Cs^+ < Rb^+$

Solution

Hydration decreases with a decrement in charge density of an ion

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#1611279

Topic: Thermodynamic principles of metallurgy

Ellingham diagram is used for:

A	Reduction

B   Electrolysis

C   Zone refining

D   Van-Arkel

Solution

With the help of Ellingham diagram we can select proper reducing agent $(C_{(s)}$ or CO or $Al)$ for metal compound

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#1611283

Topic: Isotopes, isobars, isotones and isoelectronics

In isoelectronic species Cl^-, Ar, Ca^{2+} size differ due to:

A	nuclear charge

B   electronic-electronic repulsion in valence shell

C   magnetic quantum number

D   principal quantum number

Solution

In isoelectronic species, number of electrons are same but size decrease with increase in atomic number of nuclear charge

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#1611300

Topic: Heat capacity, specific heat capacity and molar heat capacity

3 mole of Ag is heated from $300K$ to $1000K$. Calculate ΔH when $P = 1atm$ and $C_p = 23 + 0.01T$.

A	$62 \, kJ/mol$

B $45 \, kJ/mol$

C $38 \, kJ/mol$

D $54 \, kJ/mol$

Solution

$$\Delta H = \int_{T_1}^{T_2} nCpdT = n \int_{300}^{1000} (23 + 0.01T)dT$$

$$= 3 \left[23T + \frac{0.01T^2}{2} \right]_{300}^{1000}$$

$$= 3 \left[\frac{2 \times 23 \times 700 + 9100}{2} \right]$$

$$61950 \ J/mol \simeq 62 \ kJ/mol$$

#1611307

Topic: Important compounds of transition elements

$FeC_2O_4, Fe_2(C_2O_4)_3, FeSO_4, Fe_2(SO_4)_3$ one mole each, will react with how many moles of acidified $KMnO_4$?

A   1
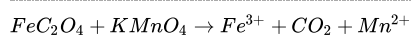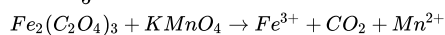
B   2

C   3

D   5

Solution

$$FeC_2O_4 + KMnO_4 \rightarrow Fe^{3+} + CO_2 + Mn^{2+}$$

$v.\,f. = 3 v.\,f = 5$

$1 \times 3 = mole \times 5$

Mole $= \dfrac{3}{5}$

$$Fe_2(C_2O_4)_3 + KMnO_4 \rightarrow Fe^{3+} + CO_2 + Mn^{2+}$$

$v.\,f = 6 \qquad v.\,f = 5$

$1 \times 6 = mole \times 5$

Mole $= \dfrac{6}{5}$

$$FeSO_4 + KMnO_4 \rightarrow Fe^{3+} + SO_4^{2-} + Mn^{2+}$$
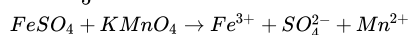
$v.\,f = 1 \quad v.\,f = 5$

$1 \times 1 = moles \times 5$

Mole $= \dfrac{1}{5}$

$Fe_2(SO_4)_3$ doesn't oxidise

Total moles of $KMnO_4 = \dfrac{3}{5} + \dfrac{6}{5} + \dfrac{1}{5} = 2$

#1611379

Topic: Rate law expression and order of reaction

For $2A + B \rightarrow C$. find the rate law

[A]	[B]	Initial Rate
0.05	0.05	0.045
0.10	0.05	0.09
0.20	0.10	0.72

A $R = K[A][B]$

B $R = k[A][B]^2$

C $R = k[A^2][B]$

D $R = [A]^2[B]^2$

Solution

$$\text{Rate} = K[A]^x[B]^y$$

$$r_1 = k[A]_1^x[B]_1^y$$

$$r_2 = k[A]_2^x[B]_2^y$$

$$\frac{r_2}{r_a} = \left(\frac{[A]_2}{[A]_1}\right)^x$$

$$\frac{0.09}{0.045} = \left(\frac{0.1}{0.05}\right)^x$$

$$2 = 2^x \qquad \therefore x = 1$$

$$r_3 = k[A]_3^x[B]_3^y$$

$$\frac{r_3}{r_2} = \left(\frac{[A]_3}{[A]_2}\right)^1 \left(\frac{[B]_3}{[B]_1}\right)^y$$

$$\frac{0.72}{0.09} = \left(\frac{0.2}{0.1}\right)^1 \left(\frac{0.1}{0.05}\right)^1$$

$$8 = 2^1 2^y$$

$$2^y = 4$$

$$\therefore y = 2$$

$$\therefore R = k[A][B]^2$$

#1611383

Topic: Lanthanoids

Which of the following lanthanoid ions are coloured?

(a) Lu^{+3} (b) Pm^{+3} (c) Sm^{+3} (d) Eu^{+3}

A $Lu^{+3}, Pm^{+3}, Sm^{+3}$

B $Pm^{+3}, Sm^{+3}, Eu^{+3}$

C $Lu^{+3}, Sm^{+3}, Eu^{+3}$

D   None of these

Solution

Lu^{+3} colourless $(4f^{14})$

Pm^{3+}, Pink $(4f^4)$

Sm^{+3} yellow $(4f^5)$

Eu^{+3}, Pink $(4f^6)$