JEE Main April 2024

Question Paper With Text Solution

06 April | Shift-1

CHEMISTRY

61. Consider the following complexes

    $[CoCl(NH_3)_5]^{2+}$, $[Co(CN)_6]^{3-}$, $[Co(NH_3)_5(H_2O)]^{3+}$, $[Cu(H_2O)_4]^{2+}$
       (A)   (B)   (C)   (D)

    The correct order of A, B, C and D in terms of wave nunber of light absorbed is :

    (1) A < C < B < D   (2) C < D < A < B   (3) B < C < A < D   (4) D < A < C < B

    Question ID: 68019114134

    Ans. Official Answer by NTA (4)

    Sol. More the Δ_0 morewill be the spilitting Δ_0 α wave number
    B > C > A > D

62. Functional group present in sulphonic acids is :

    (1) $\begin{matrix} -S-OH \\ \| \\ O \end{matrix}$ (2) $-SO_2$ (3) $-SO_4H$ (4) $-SO_3H$

    Question ID: 68019114138

    Ans. Official Answer by NTA (4)

    Sol. Sulphonic group is $- SO_3H$

63. Which of the following material is not a semiconductor.

    (1) Silicon   (2) Germanium   (3) Copper oxide   (4) Graphite

    Question ID: 68019114127

    Ans. Official Answer by NTA (4)

    Sol. Graphite is not semiconductor.

64. Match List I with List II

	List I	List II
	(Compound)	(Uses)
A.	Iodoform	I. Fire extinguisher
B.	Carbon tetrachloride	II. Insecticide
C.	CFC	III. Antiseptic
D.	DDT	IV. Refrigerants

    Choose the correct answer from the options given below :

    (1) A-II, B-IV, C-I, D-III   (2) A-III, B-I, C-IV, D-II

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(3) A-III, B-II, C-IV, D-I   (4) A-I, B-II, C-III, D-IV

Question ID: 68019114139

Ans.   Official Answer by NTA (2)

Sol.   (A) Iodoform $\rightarrow$ Antiseptic
        (B) Carbon tetrachloride $\rightarrow$ fire extinguisher
        (C) CFC $\rightarrow$ Refrigerator
        (D) DDT $\rightarrow$ Insectiside

65.   Match List I with List II

List I		List II	
(Precipitating reagent and conditions)		**(Cation)**	
A.	$NH_4Cl + NH_4OH$	I.	Mn^{2+}
B.	$NH_4OH + Na_2CO_3$	II.	Pb^{2+}
C.	$NH_4OH + NH_4Cl + H_2O$ gas	III.	Al^{3+}
D.	dilute HCl	IV.	Sr^{2+}

Choose the correct answer from the options given below :

(1) A-IV, B-III, C-II, D-I   (2) A-IV, B-III, C-I, D-II

(3) A-III, B-IV, C-I, D-II   (4) A-III, B-IV, C-II, D-I

Question ID: 68019114135

Ans.   Official Answer by NTA (3)

Sol.   Theoritical

66.   Given below are two statements :

Statement I : Piciric acid is 2,4,6 - trinitrotoluene.

Statement II : Phenol - 2,4 - disulphonic acid is treated with Conc. HNO_3 to get picric acid.

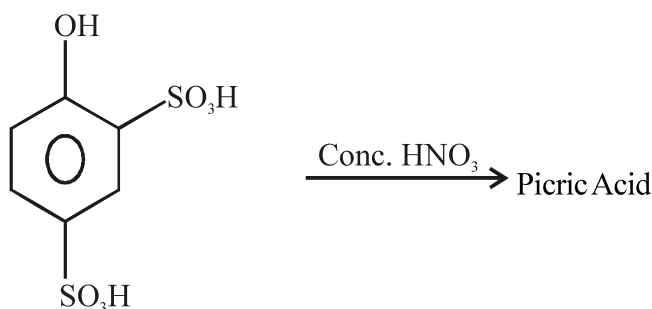In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both statement I and statement II are correct

(2) Statement I is incorrect but statement II is correct

(3) Statement I is correct but statement II is incorrect

(4) Both statement I and statement II are incorrect
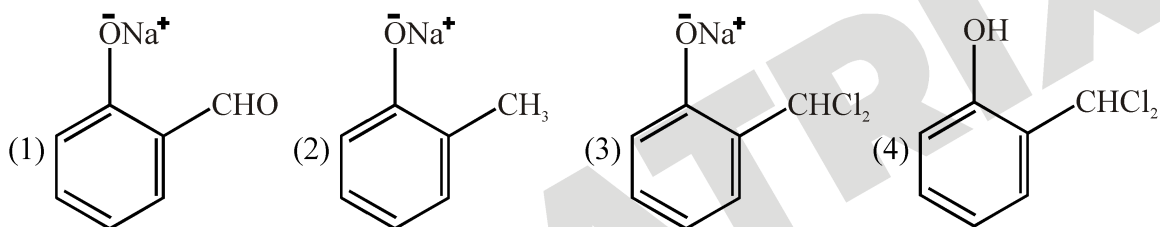
Question ID: 68019114140

Ans.   Official Answer by NTA (2)

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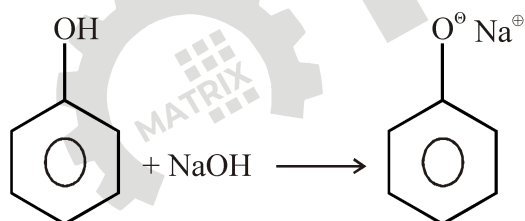Sol.   Picric Acid is 2,4,6 tripitrophenol

67.   In Reimer - Tiemann reaction, phenol is converted into salicylaldehyde through an intermediate. The structure of internediate is _____ .
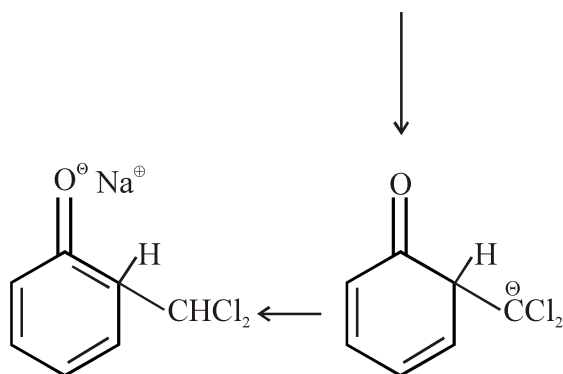

Question ID: 68019114141

Ans.   Official Answer by NTA (3)

Sol.

68.   A conductivity cell with two electrodes (dark side) are half filled with infinitely dilute aqueous solution of a weak electrolyte. If volume is doubled by adding more water at constant temperature, the molar conductivity of the
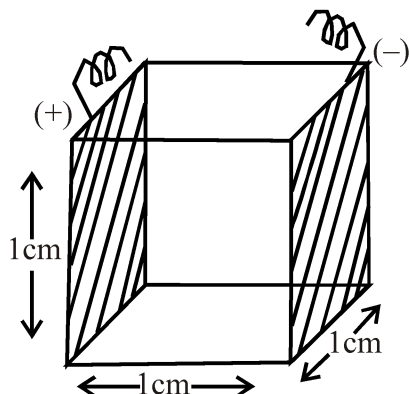
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cell will –

(1) remain same or can not be measured accurately

(2) depend upon type of electrolyte

(3) increase sharply

(4) decrease sharply

Question ID: 68019114128

Ans.   Official Answer by NTA (1)

Answer by Matrix (3)

Sol.   On dilution $\wedge M$ increases

69.   The number of element from the following that do not belong to lanthanoids is

Eu, Cm, Er, Tb, Yb and Lu

(1) 3   (2) 4   (3) 5   (4) 1

Question ID: 68019114132

Ans.   Official Answer by NTA (4)

Sol.   Lanthanoids are : Eu, Tb, Yb, Er, Lu

70.   Given below are two statements :

Statement I : Gallium is used in the manufacturing of thermometers.

Statements II : A thermometer containing gallium is useful for measuring the freezing point (256 K) of brine solution.

In the light of the above statements, choose the correct answer from the options given below :

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(1) Statement I is false but statement II is true

(2) Statement I is true but statement II is false

(3) Both statement I and statement II are true

(4) Both statement I and statement II are false

Question ID: 68019114130

Ans.   Official Answer by NTA (2)

Sol.   Statement I : True
Statement II : False
Because M.P. of Ga is 302 K, it can't measure 256 K.

71.   Match List I with List II

List I	List II
(Molecule/Species)	**(Property/Shape)**
A. SO_2Cl_2	I. Paramagnetic
B. NO	II. Diamagnetic
C. NO_2^-	III. Tetrahedral
D. I_3^-	IV. Linear

Choose the correct answer from the options given below :

(1) A-II, B-III, C-I, D-IV   (2) A-III, B-IV, C-II, D-I

(3) A-III, B-I, C-II, D-IV   (4) A-IV, B-I, C-III, D-II

Question ID: 68019114125

Ans.   Official Answer by NTA (3)

Sol.   A → II, III
B → I, IV
C → II
D → II, IV

72.   Match List I with List II

List I	ListII
(Hybridization)	**(Orientation in Space)**
A. sp^3	I. Trigonal bipyramidal
B. dsp^2	II. Octahedral

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C. sp^{3}d   III. Tetrahedral

D. sp^{3}d^2 IV. Square planar

Choose the correct answer from the options given below :

(1) A-IV, B-III, C-I, D-II   (2) A-II, B-I, C-IV, D-III

(3) A-III, B-IV, C-I, D-II   (4) A-III, B-I, C-IV, D-II

Question ID: 68019114133

Ans.   Official Answer by NTA (3)

Sol.   (A) $\rightarrow$ III
       (B) $\rightarrow$ IV
       (C) $\rightarrow$ I
       (D) $\rightarrow$ II

73.   The density of 'x' M solution ('x' molar) of NaOH is 1.12 g mL^{-1}, while in molality, the concentration of the solution is 3 m (3 molal). Then x is

(Given : Molar mass of NaOH is 40 g/mol)

(1) 2.8   (2) 3.5   (3) 3.8   (4) 3.0

Question ID: 68019114124

Ans.   Official Answer by NTA (4)

Sol.   Let volume of solution is 1000 ml

$W_{solution} = 1.12 \times 1000 = 1120$ gm

$Molality = \dfrac{moles \ of \ solute}{weight \ of \ solvent} = 3$

Weight of solvent = x kg = 1000 gm
moles of solute = 3x
$W_{solute} = 3x \times 40 = 120 \ x$
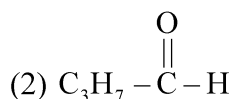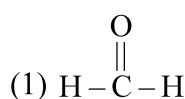$W_{solvent} + W_{solvent} = W_{solution}$
$1000 + 120x = 1120$
x = 1

$M = \dfrac{moles \ of \ solute}{Volume \ of \ solution} = \dfrac{3}{1} = 3$

74.   Which among the following aldehydes is most reactive towards nucleophilic addition reactions ?
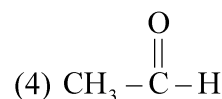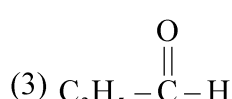
(1) $H-\overset{\overset{\displaystyle O}{||}}{C}-H$ (2) $C_3H_7-\overset{\overset{\displaystyle O}{||}}{C}-H$ (3) $C_2H_5-\overset{\overset{\displaystyle O}{||}}{C}-H$ (4) $CH_3-\overset{\overset{\displaystyle O}{||}}{C}-H$

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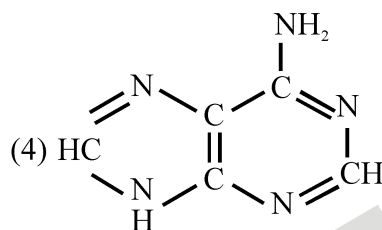**Website :** www.matrixedu.in ; Email : smd@matrixacademy.co.in

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Question ID: 68019114142

Ans. Official Answer by NTA (1)

Sol. Formaldohyde is most reactive

75. The electron affinity value are negative for

A. Be → Be⁻

A. $Be \rightarrow Be^-$

B. $N \rightarrow N^-$

C. $O \rightarrow O^{2-}$

D. $Na \rightarrow Na^-$

E. $Al \rightarrow Al^-$

Choose the most appropriate answer from the options given below :

(1) A, B, D and E only   (2) A and D only

(3) D and E only   (4) A, B and C only

Question ID: 68019114129

Ans. Official Answer by NTA (3)

Sol. Negative value are for → D, E

76. At –20 °C and 1 atm pressure, a cylinder is filled with equal number of H_2, I_2 and HI molecules for the reaction

$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$, the K_p for the process is x × 10⁻¹.

x = _____.

[Given : R = 0.082 L atm K⁻¹ mol⁻¹]

(1) 2   (2) 10   (3) 1   (4) 0.01
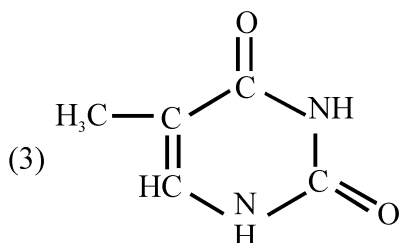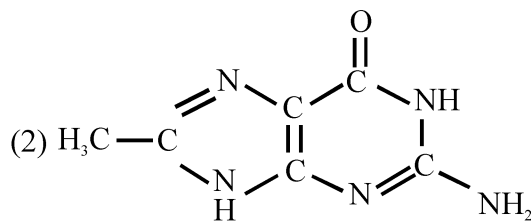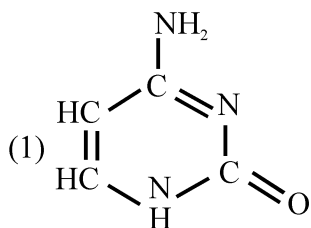
Question ID: 68019114126

Ans. Official Answer by NTA (2)

Sol. Equal number of molecules means same pressure

$P_{H_2} = P_{I_2} = P_{HI}$ (At equation)

$K_P = 1 = x \times 10^{-1}$
x = 10

77. DNA molecule contains 4 bases whose structure are shown below. One of the structures is not correct, identify the incorrect base structure.
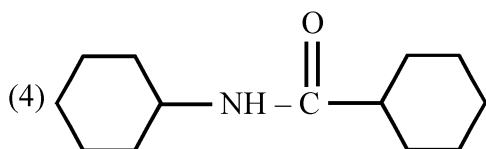
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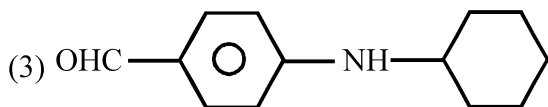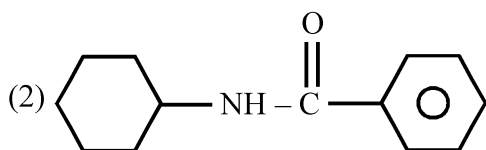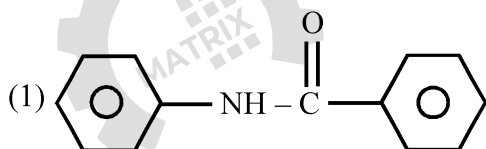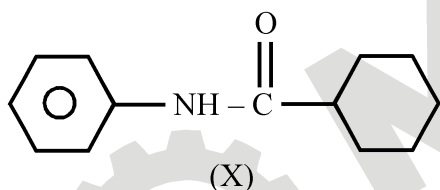Page No. 8

(1)

(2)

(3)

(4)

Question ID: 68019114143

Ans.   Official Answer by NTA (2)

Sol.   Urocil is not present in D.N.A.

78.   Which of the following is metamer of the given compound (X) ?

(X)

(1)

(2)

(3)

(4)

Question ID: 68019114137

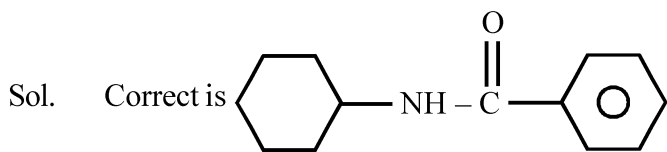**MATRIX JEE ACADEMY**
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Ans.   Official Answer by NTA (2)

Sol.   Correct is

79.   Which of the following statements are correct ?

A. Glycerol is purified by vacuum distillation because it decomposes at its normal boiling point.

B. Aniline can be purified by steam distillation as aniline is miscible in water.

C. Ethanol can be separated from ethanol water mixture by azeotropic distillation because it forms azeotrope.

D. An organic compound is pure, if mixed M.P. is remained same.

Choose the most appropriate answer from the options given below :

(1) A, C, D only   (2) B, C, D only   (3) A, B, D only   (4) A, B, C only

Question ID: 68019114136

Ans.   Official Answer by NTA (1)

Sol.   Statement 'C' is incorrect because azeotropes can't be seprated by distillation

80.   Match List I with List II

List I	List II
(Compound/Species)	(Shape/Geometry)
A. SF_4	I. Tetrahedral
B. BrF_3	II. Pyramidal
C. BrO_3^-	III. See saw
D. NH_4^+	IV. Bent T-Shape

Choose the correct answer from the options given below :

(1) A-III, B-IV, C-II, D-I   (2) A-II, B-III, C-I, D-IV

(3) A-II, B-IV, C-III, D-I   (4) A-III, B-II, C-IV, D-I

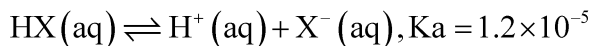Question ID: 68019114131

Ans.   Official Answer by NTA (1)

Sol.   (A) $\rightarrow$ III
       (B) $\rightarrow$ IV
       (C) $\rightarrow$ II
       (D) $\rightarrow$ I

81.   Consider the dissociation of the weak acid HX as given below

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$$HX(aq) \rightleftharpoons H^+(aq) + X^-(aq), Ka = 1.2 \times 10^{-5}$$

[K_a : dissociation constant]

The osmotic pressure of 0.03 M aqueous solution of HX at 300 K is _____ $\times 10^{-2}$ bar (nearest integer).

Question ID: 68019114147

Ans.   Official Answer by NTA (76)

Sol. $K_a = \dfrac{C\alpha^2}{1-\alpha}$

$1.2 \times 10^{-5} = \dfrac{0.03\alpha^2}{1-\alpha}$

$\alpha = 0.02$
i = 1.02
$\pi = (1.02)(.03)(0.0830)\,300$
$\pi = 0.76$ bar
Ans. 76

82.   Among CrO, Cr_2O_3 and CrO_3, the sum of spin-only magnetic moment values of basic and amphoterix oxides

is _____ 10^{-2} BM (nearest integer).

(Given atomic number of Cr is 24)
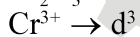
Question ID: 68019114149

Ans.   Official Answer by NTA (877)

Sol. $CrO \rightarrow$ basic oxide
$Cr^{2+} \rightarrow d^4$
M = 3.87 B.M.
$Cr_2O_3 \rightarrow$ Amphoteric
$Cr^{3+} \rightarrow d^3$
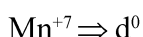M = 4.9
Sum = 3.87 + 4.9 = 8.17
Ans. 877

83.   The difference in the 'spin-only' magnetic moment values of $KMnO_4$ and the manganese product formed during

titration of $KMnO_4$ against oxalic acid in acidic medium is _____ BM. (nearest integer)
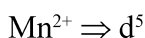
Question ID: 68019114150

Ans.   Official Answer by NTA (6)

Sol.   Product is Mn^{2+}
$Mn^{+7} \Rightarrow d^0$
M = 0
$Mn^{2+} \Rightarrow d^5$
M = 5.91

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$\Delta M = 5.91$

84. An ideal gas, $\overline{C}_v = \dfrac{5}{2}R$, is expanded adiabatically agains a constant pressure of 1 atm untill it doubles in volume. If the initial temperature and pressure is 298 K and 5 atm, respectively then the final temperature is _____ K (nearest integer).

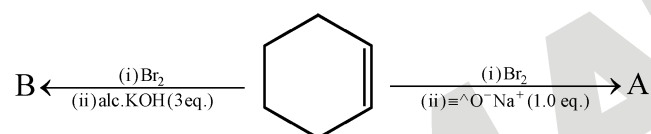[$\overline{C}_v$ is the molar heat capacity at constant volume]

Question ID: 68019114146

Ans. Official Answer by NTA (274)

Sol. $\dfrac{nR\Delta T}{\mu - 1} = -P_{ext}\left(V_i\right)$

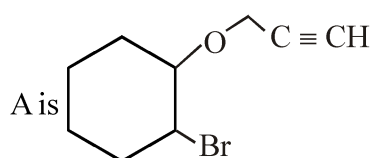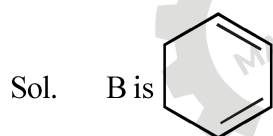$\dfrac{T_2 - T_1}{\mu - 1} = -1 \times \dfrac{T_i}{P_i}$

$T_2 = 274$

85. The major products from the following reaction sequence are product A and product B.

$$B \xleftarrow[\text{(ii) alc.KOH(3 eq.)}]{\text{(i) Br}_2} \quad \bigcirc \quad \xrightarrow[\text{(ii)} \equiv{}^\wedge O^- Na^+ (1.0 \text{ eq.})]{\text{(i) Br}_2} A$$

The total sum of π electrons in product A and product B are _____ (nearest integer)
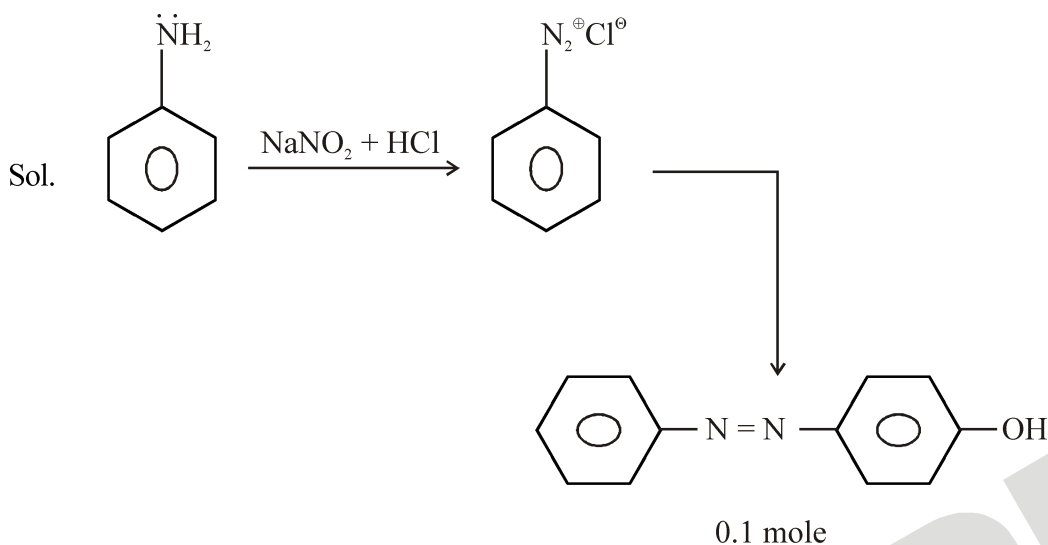
Question ID: 68019114152

Ans. Official Answer by NTA (8)

Sol. B is

A is

86. 9.3 g of pure aniline upon diazotisation followed by coupling with phenol gives an orange dye. The mass of orange dye produced (assume 100% yield/conversion) is _____ g. (nearest integer)

Question ID: 68019114153

Ans. Official Answer by NTA (20)

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Sol.

0.1 mole

Mass formed = 0.1 × 198 = 19.8 gm

87. Frequency of the de-Broglie wave of electron in Bohr's first orbit of hydrogen atom is _____ × 10^{13} Hz (nearest integer).
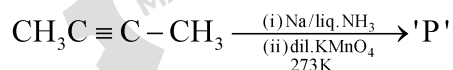
[Given : R_H (Rydberg constant) = 2.18×10^{-18} J, h (Plank's constant) = 6.6×10^{-34} J.s.]
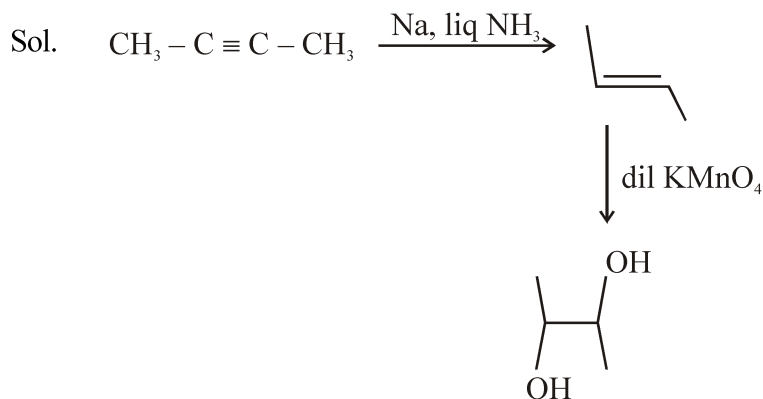
Question ID: 68019114144

Ans. Official Answer by NTA (658)

Sol.

88. The major product of the following reaction is P.

$$CH_3C \equiv C - CH_3 \xrightarrow[\substack{(ii)\,dil.KMnO_4 \\ 273K}]{(i)\,Na/liq.\,NH_3} 'P'$$

Number of oxygen atoms persent in product 'P' is _____.

(nearest integer)

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Ans. Official Answer by NTA (2)

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Sol.

$$CH_3 - C \equiv C - CH_3 \xrightarrow{\text{Na, liq NH}_3}$$

$\downarrow$ dil KMnO$_4$

89. Time required for 99.9% completion of a first order reaction is _____ times the time required for completion of 90% reaction. (nearest integer)
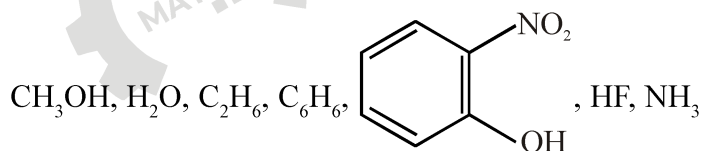
Question ID: 68019114148

Ans. Official Answer by NTA (3)

Sol.
$$t_{99.9\%} = \frac{1}{K} \ln\left(\frac{100}{0.1}\right)$$

$$t_{90\%} = \frac{1}{K} \ln\left(\frac{100}{10}\right)$$

$$\frac{t_{99.9\%}}{t_{90\%}} = \frac{\ln(1000)}{\ln 10} = 3$$

90. Number of molecules from the following which can exhibit hydrogen bonding is _____. (nearest integer)

CH_3OH, H_2O, C_2H_6, C_6H_6,

, HF, NH$_3$

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Ans. Official Answer by NTA (5)

Sol. Following can exhibit H Bonding

CH_3OH, H_2O,

, HF, NH$_3$

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