JEE Main 2023 (2nd Attempted)
(Shift - 02 Chemistry Paper) 08.04.2023

CHEMISTRY | **TEST PAPER WITH SOLUTION**

SECTION-A

61. Which of the following have same number of significant figures ?

(A) 0.00253

(B) 1.0003

(C) 15.0

(D) 163

Choose the correct answer from the options given below

(1) A, B and C only

(2) C and D only

(3) A, C and D only

(4) B and C only

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. All non zero digits are significant.

0.00253

Significant figures = 3(2, 5, 3)

1.0003

Zeros between non-zero digit are significant.

Thus, 1.0003 has 5 significant figures.

15.0

Significant number = 3

163

Significant number = 3

Options (3) – A, C and D

62. Which of these reactions is not a part of breakdown of ozone in stratosphere ?

(1) $\dot{Cl}O(g) + O(g) \longrightarrow \dot{Cl}(g) + O_2(g)$

(2) $\dot{Cl}(g) + O_3(g) \longrightarrow \dot{Cl}O(g) + O_2(g)$

(3) $2\ \dot{Cl}O \longrightarrow ClO_2(g) + \dot{Cl}(g)$

(4) $CF_2Cl_2(g) \xrightarrow{uv} \dot{Cl}(g) + \dot{C}F_2Cl(g)$

Official Ans. by NTA (3)

Allen Ans. (3)

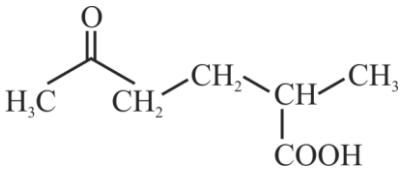
Sol. Ozone destruction

$CF_2Cl_2 \xrightarrow{hv} Cl^{\bullet} + C^{\bullet}F_2Cl(g)$

$Cl^{\bullet} + O_3 \rightarrow ClO^{\bullet} + O_2$

$ClO^{\bullet} + O^{\bullet} \rightarrow Cl^{\bullet} + O_2$

63. The correct IUPAC nomenclature for the following compound is



(1) 5–Formyl–2–methylhexanoic acid

(2) 2–Methyl–5–oxohexanoic acid

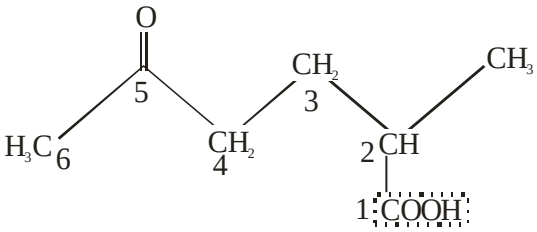
(3) 2–Formyl–5–methylhexan–6–oic acid

(4) 5–Methyl–2–oxohexan–6–oic acid

Official Ans. by NTA (2)

Allen Ans. (2)

Sol.



IUPAC NAME

2–Methyl–5–oxohexanoic acid

64. Arrange the following gases in increasing order of van der Waals constant 'a'

A. Ar

B. CH_4

C. H_2O

D. C_6H_6

Choose the correct option from the following :-

(1) B, C, D and A

(2) C, D, B and A

(3) A, B, C and D

(4) D, C, B and A

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. Vanderwaal constant – 'a'

(i) Ar = 1.34

(ii) CH_4 = 2.25

(iii) H_2O = 5.46

(iv) C_6H_6 = 18.57

'a' symbolises force of attraction and directly proportional to surface area

65. Given below are two statements :-

Statement I :- Methyl orange is a weak acid.

Statement II :- The benzenoid form of methyl orange is more intense/deeply coloured than the quinonoid form.

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

(1) Statement I is correct but Statement II is incorrect.

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

(3) Both Statement I and Statement II are incorrect.

(4) Both statement I and Statement II are correct.

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. Methyl orange is weak base .

Benzenoid structure $\rightleftharpoons$ Quinonoid structure

(yellow coloured) (Red coloured)

(more intense)

Statement I – FALSE

Statement II – FALSE

66. Given below are two statements :-

Statement I :- In redox titration, the indicators used are sensitive to change in pH of the solution.

Statement II :- In acid-base titration, the indicators used are sensitive to change in oxidation potential.

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.

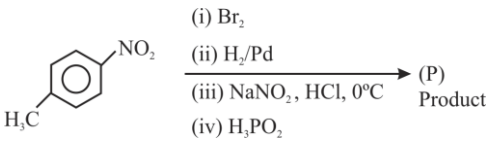
Official Ans. by NTA (4)

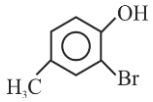
Allen Ans. (4)

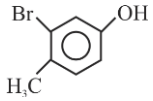
Sol. In redox titration, indicators are sensitive to oxidation potential and in acid base titration, indicators are sensitive to change in pH of solution

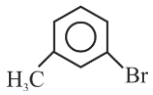
Both statement are false.

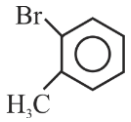
67. The product (P) formed from the following multistep reaction is :-



(1) 

(2) 

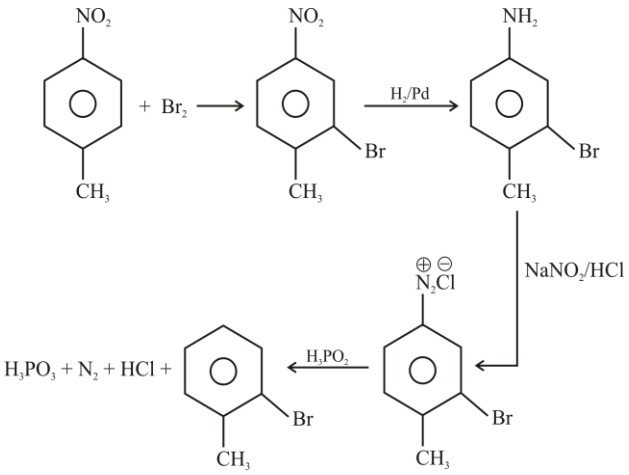
(3) 

(4) 

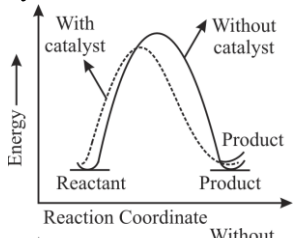
Official Ans. by NTA (4)

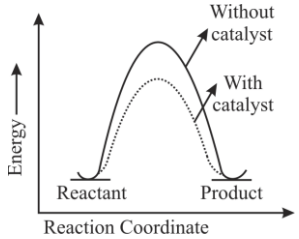
Allen Ans. (4)

Sol.

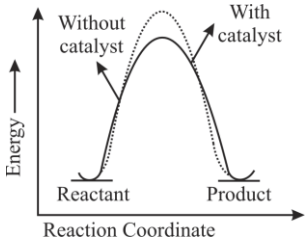


68. The correct reaction profile diagram for a positive catalyst reaction.

(1) 

(2) 

(3)



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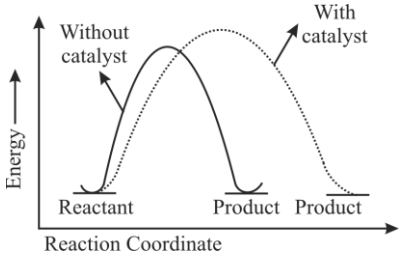


Official Ans. by NTA (2)

Allen Ans. (2)

Sol. By using positive catalyst :

(i) ΔH does not change

(ii) Activation energy decreases

69. Which of the following can reduce decomposition of H_2O_2 on exposure to light

(1) Alkali

(2) Urea

(3) Dust

(4) Glass containers

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. Urea acts as a stabilizer in the decomposition of H_2O_2

70. The statement/s which are true about antagonists from the following is/are :-

A. They bind to the receptor site.

B. Get transferred inside the cell for their action.

C. Inhibit the natural communication of the body.

D. Mimic the natural messenger.

Choose the correct answer from the options given below :-

(1) B only

(2) A, C and D

(3) A and B

(4) A and C

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. Drugs that bind to the receptor site and inhibit its natural function are called antagonists

71. Match List I with List II :-

	List I Coordination Complex		List II Number of unpaired electrons
A.	$[Cr(CN)_6]^{3-}$	I.	0
B.	$[Fe(H_2O)_6]^{2+}$	II.	3
C.	$[Co(NH_3)_6]^{3+}$	III.	2
D.	$[Ni(NH_3)_6]^{2+}$	IV.	4

Choose the correct answer from the options given below :-

(1) A – II, B – IV, C – I, D – III

(2) A – IV, B – III, C – II, D – I

(3) A – III, B – IV, C – I, D – II

(4) A – II, B – I, C – IV, D – III

Official Ans. by NTA (1)

Allen Ans. (1)

Sol. For option (A)

Cr^{+3} : $3d^3$

$CN^- \rightarrow$ SFL

$\Rightarrow$ No. of unpaired electrons = 3

For option (B)

Fe^{+2} : $3d^6$

H_2O : WFL

No. of unpaired electrons = 4

For option (C)

Co^{+3} : $3d^6$

NH_3 : SFL

No. of unpaired electrons = 0

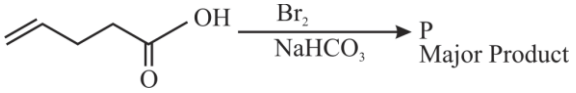
For option (D)

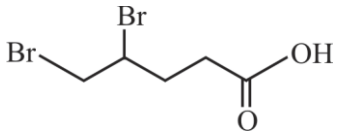
Ni^{+2} : $3d^8$

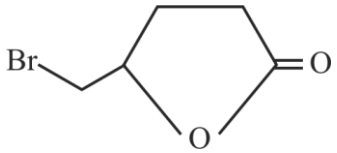
NH_3 : SFL

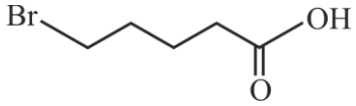
No. of unpaired electrons = 2

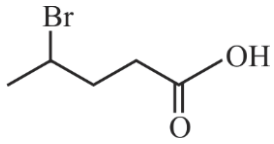
72. Major product 'P' formed in the following reaction is :-



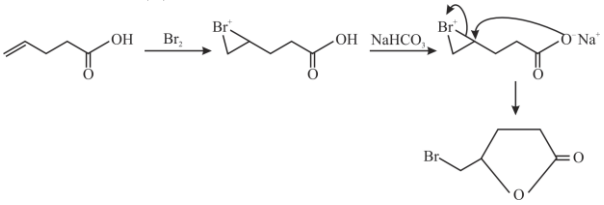
(1) 

(2) 

(3) 

(4) 

Official Ans. by NTA (2)
Allen Ans. (2)

Sol. 

73. In Hall – Heroult process, the following is used for reducing Al_2O_3 :-
(1) Graphite
(2) Magnesium
(3) Na_3AlF_6
(4) CaF_2
Official Ans. by NTA (1)
Allen Ans. (1)

Sol. In case of Hall's process, reduction of Al_2O_3 to Al can be done using graphite.

74. Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R**
Assertion A :- Sodium is about 30 times as abundant as potassium in the oceans.
Reason R :- Potassium is bigger in size than sodium.
In the light of above statements, choose the correct answer from the options given below

(1) Both A and R are true and R is the correct explanation of A.
(2) A is true but R is false.
(3) A is false but R is true
(4) Both A and R are true but R is NOT the correct explanation of A.
Official Ans. by NTA (1)
Allen Ans. (4)

Sol. Due to bigger size of potassium, it forms more efficient lattices as compared to sodium with silicates.
The abundance of sodium in ocean is more due to the more soluble nature of salt of sodium as compared to potassium salts.

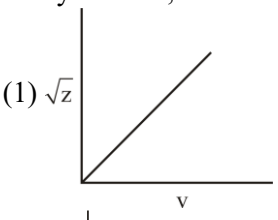
75. Math List I with List II
Choose the correct answer from the options given below :

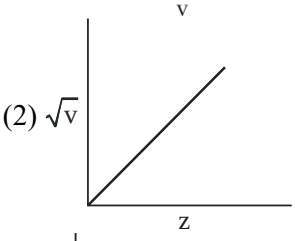
	List I Natural amino acid		**List II One letter code**
A.	Glutamic acid	I.	Q
B.	Glutamine	II.	W
C.	Tyrosine	III.	E
D.	Tryptophan	IV.	Y

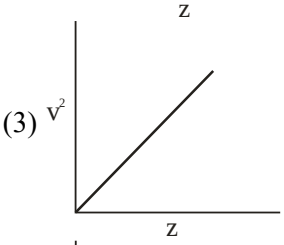
(1) A-II, B-I, C-IV, D-III
(2) A-IV, B-III, C-I, D-II
(3) A-III, B-I, C-IV, D-II
(4) A-III, B-IV, C-I, D-II
Official Ans. by NTA (3)
Allen Ans. (3)

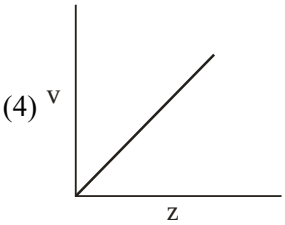
Sol. According to List I and List II option (3) is correct.

76. Henry Moseley studied characteristic X-ray spectra of elements. The graph which represents his observation correctly is : (Given v = frequency of X-ray emitted; Z = atomic number)

(1) 

(2) 

(3) 

(4) 

Official Ans. by NTA (2)
Allen Ans. (2)

Sol. $\sqrt{v} \alpha Z$

77. The descending order of acidity for the following carboxylic acid is :

A. CH_3COOH

B. $F_3C–COOH$

C. $ClCH_2–COOH$

D. $FCH_2–COOH$

E. $BrCH_2–COOH$

Choose the correct answer from the options given below :

(1) D > B > A > E > C

(2) E > D > B > A > C

(3) B > C > D > E > A

(4) B > D > C > E > A

Official Ans. by NTA (4)

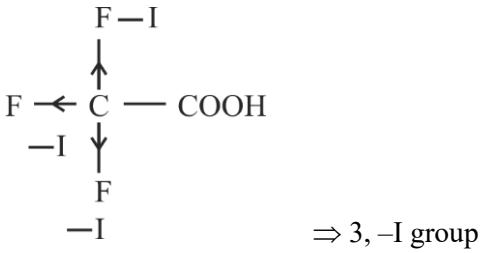
Allen Ans. (4)

Sol. $\text{Acidic Strength } \alpha \frac{1}{+I \text{ effect}}$

$\boxed{\text{Acidic Strength } \alpha -I \text{ effect}}$

$\boxed{F > Cl > Br}$ – I effect order

(A) $CH_3 \rightarrow COOH$ ($+I$)

(B) 

$\Rightarrow$ 3, –I group

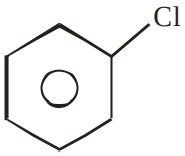
(C) $Cl \leftarrow CH_2 \rightarrow COOH$ ($-I$)

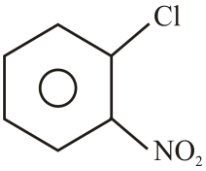
(D) $F \leftarrow CH_2 \rightarrow COOH$ ($-I$)

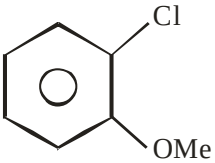
(E) $Br \leftarrow CH_2 \rightarrow COOH$ ($-I$)

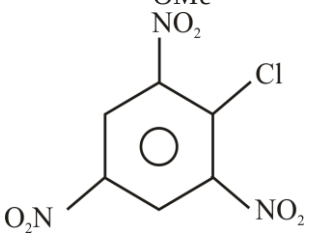
So Option (4) B > D > C > E > A

78. The correct order of reactivity of following haloarenes towards nucleophilic substitution with aqueous NaoH is :

A. 

B. 

C. 

D. 

Choose the correct answer from the options given below :

(1) A > B > D > C

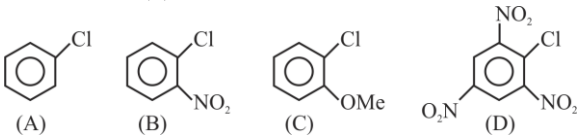
(2) C > A > D > B

(3) D > C > B > A

(4) D > B > A > C

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. 

$\boxed{D > B > A > C}$

Option (4) is correct.

(– M) group increases reactivity where as (+M) group decreases reactivity of Halobenzene towards Nucleophilic substitution reaction.

79. For a good quality cement, the ratio of lime to the total of the oxides of Si, Al and Fe should be as close as to :

(1) 4

(2) 2

(3) 3

(4) 1

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. $\frac{\%\ CaO}{\%\ SiO_2 + \%Al_2O_3 + \%Fe_2O_3} = 1.9 - 2.1$

Option (2) is correct.

80. A compound 'X' when treated with phthalic anhydride in presence of concentrated H_2SO_4 yields 'Y'. 'Y' is used as an acid/base indicator. 'X' and 'Y' are respectively:

(1) Carbolic acid, Phenolphthalein

(2) Anisole, methyl orange

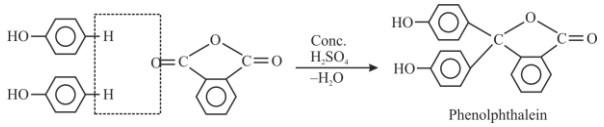
(3) Salicylaldehyde, Phenolphthalein

(4) Toludine, Phenolphthalein

Official Ans. by NTA (1)

Allen Ans. (1)

Sol



Phenolphthalein

SECTION-B

81. The solubility product of $BaSO_4$ is 1×10^{-10} at 298K. The solubility of $BaSO_4$ in 0.1 M K_2SO_4(aq) solution is _____ $\times 10^{-9}$ g L^{-1} (nearest integer).

Given : Molar mass of $BaSO_4$ is 233 g mol^{-1}

Official Ans. by NTA (233)

Allen Ans. (233)

Sol. $K_2SO_4 \longrightarrow 2K^+ + SO_4^{2-}$

0.1 M 0.2M 0.1M

$BaSO_4 \rightleftharpoons Ba^{+2} + SO_4^{2-}$

a–S S S + 0.1 $\approx$ 0.1

$K_{SP} = S \times 10^{-1}$

$\Rightarrow 1 \times 10^{-10} = S \times 10^{-1}$

$\Rightarrow S = 10^{-9}$ mol L^{-1}

So, $S = 10^{-9} \times 233$ g L^{-1}

So, Answer : 233

82. Coagulating value of electrolytes $AlCl_3$ and NaCl for As_2S_3 are 0.09 and 50.04 respectively. The coagulating power of $AlCl_3$ is x times the coagulating power of NaCl. The value of x is _____:

Official Ans. by NTA (556)

Allen Ans. (556)

Sol. $$\underset{(C.V)}{\text{Coagulating Value}} \propto \frac{1}{\underset{(C.P)}{\text{Coagulating Power}}}$$

$$\Rightarrow \frac{(C.V)_{AlCl_3}}{(C.V)_{NaCl}} = \frac{(C.P)_{NaCl}}{(C.P)_{AlCl_3}}$$

$$\Rightarrow \frac{0.09}{50.04} = \frac{(C.P)_{NaCl}}{(C.P)_{AlCl_3}}$$

$$\Rightarrow (C.P)_{AlCl_3} = 556(C.P)_{NaCl}$$

So, Answer = 556

83. The number of atomic orbitals from the following having 5 radial nodes is _____.

7s, 7p, 6s, 8p, 8d

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. Radial node = n – ℓ –1

7s $\Rightarrow$ R.N = 7 – 0 – 1 = 6

7p $\Rightarrow$ R.N = 7 – 1 – 1 = 5

6s $\Rightarrow$ R.N = 6 – 0 – 1 = 5

8p $\Rightarrow$ R.N = 8 – 1 – 1 = 6

8d $\Rightarrow$ R.N = 8 – 2 – 1 = 5

So, Answer is 3

84. For complete combustion of ethene.

$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$ the amount of heat produced as measured in bomb calorimeter is 1406 kJ mol^{-1} at 300K. The minimum value of TΔS needed to reach equilibrium is (–) _____kJ. (Nearest integer)

Given : R = 8.3 JK^{-1} mol^{-1}

Official Ans. by NTA (1411)

Allen Ans. (1411)

Sol. $C_2H_4(g) + 3O_2(g) \longrightarrow 2CO_2(g) + 2H_2O(\ell)$

$\Delta U = -1406$ KJ mol^{-1}, T = 300 K

$\Delta H = \Delta U + \Delta n_g RT$

$\Delta H = -1406 + (-2) \times 8.3 \times 300 = -1406 - 4.98$

$= -1410.98$ KJ $mol^{-1} \approx -1411$

$\Delta H = T\Delta S = -1411$ KJ mol^{-1}

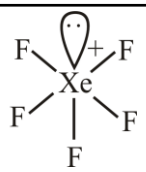
85. The number of species from the following carrying a single lone pair on central atom Xenon is ____:

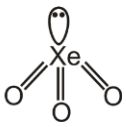
XeF_5^+, XeO_3, XeO_2F_2, XeF_5^-, XeO_3F_2, $XeOF_4$, XeF_4

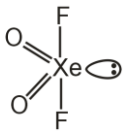
Official Ans. by NTA (4)

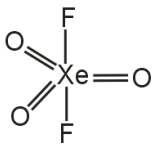
Allen Ans. (4)

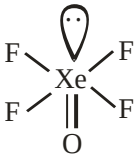
Sol.

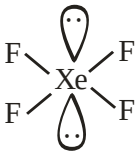
XeF_5^+ 

XeO_3 

XeO_2F_2 

XeO_3F_2 

$XeOF_4$ 

XeF_4 

So, Answer is 4

86. If the boiling points of two solvents X and Y (having same molecular weights) are in the ratio 2 : 1 and their enthalpy of vaporizations are in the ratio 1 : 2, then the boiling point elevation constant of X is m times the boiling point elevation constant of Y. The value of m is _____ (Nearest integer)

Official Ans. by NTA (8)

Allen Ans. (8)

Sol. $\frac{(T_B)_x}{(T_B)_y}=\frac{2}{1}$ $\frac{(\Delta H)_x}{(\Delta H)_y}=\frac{1}{2}$

$$\frac{(\Delta T_B)_x}{(\Delta T_B)_y}=m=\frac{(K_B)_x\times molality}{(K_B)_y\times molality}$$

$$=\frac{(T.B)_x^2}{(T.B)_y^2}\times\frac{\Delta H_y}{(\Delta H)_x}=(2)^2\times 2=8$$

87. The sum of oxidation state of the metals in $Fe(CO)_5$, VO^{2+} and WO_3 is _____ :

Official Ans. by NTA (10)

Allen Ans. (10)

Sol. $\overset{(0)}{Fe}(CO)_5$ $\overset{(+4)}{V}O^{2+}$ $\overset{(+6)}{W}O_3$

So, Sum of oxidation state = 0 + 4 + 6 = 10

88. The observed magnetic moment of the complex $[Mn(\underline{N}CS)_6]^{x-}$ is 6.06 BM. The numerical value of x is _____ :

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. $[Mn(NCS)_6]^{x-}$

Number of unpaired electron = 5

So, Mn must be in +2 oxidation state (Mn^{+2})

$\Rightarrow 2+(-6)=-x$

$\Rightarrow -4=-x$

$\Rightarrow x=4$

89. The number of incorrect statements from the following is _____

A. The electrical work that a reaction can perform at constant pressure and temperature is equal to the reaction Gibbs energy.

B. E^0_{cell} is dependent on the pressure

C. $\frac{dE^0cell}{dT}=\frac{\Delta_rS^0}{nF}$

D. A cell is operating reversibly if the cell potential is exactly balanced by an opposing source of potential difference.

Official Ans. by NTA (1)

Allen Ans. (1)

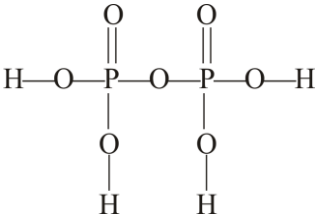
Sol. Option B is incorrect

So, Answer is 1

90. The ratio of sigma and π bonds present in pyrophosphoric acid is _____ :

Official Ans. by NTA (6)

Allen Ans. (6)

Sol. 

$\frac{\sigma}{\pi}=\frac{12}{2}=6$

So, Answer is 6