JEE Main 2023 (2nd Attempt)
(Shift - 01 Chemistry Paper) 15.04.2023

CHEMISTRY | **TEST PAPER WITH SOLUTION**

SECTION-A

61. Match List I with List II:

List I-(Monomer)	**List II-(Polymer)**
(A) Tetrafluoroethene	(i) Orlon
(B) Acrylonitrile	(ii) Natural rubber
(C) Caprolactam	(iii) Teflon
(D) Isoprene	(IV) Nylon-6

Choose the correct answer from the options given below :

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

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

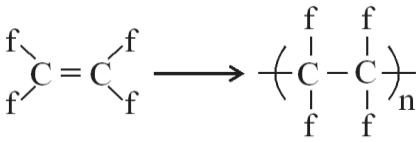
(3) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)

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

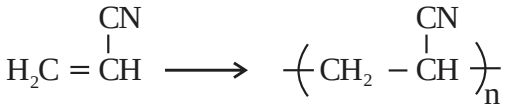
Official Ans. by NTA (1)

Allen Ans. (1)

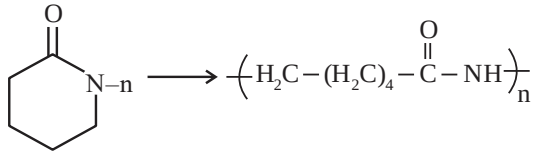
Sol.



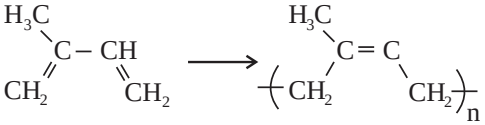
Tetra Fluoroethene Teflon



Acrylonitrile Orlon

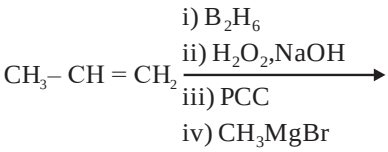


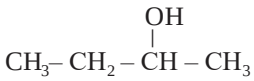
Caprolactum Nylon - 6



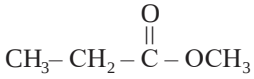
Isoprene Natural rubber

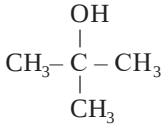
62. The product formed in the following multistep reaction is:



(1) 

(2) 

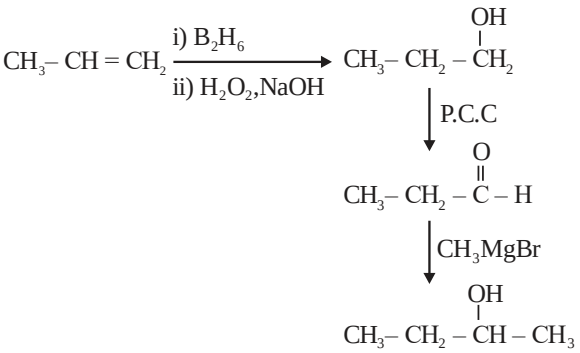
(3) 

(4) 

Official Ans. by NTA (1)

Allen Ans. (1)

Sol.



63. The possibility of photochemical smog formation will be minimum at

(1) Kolkata in October

(2) Mumbai in May

(3) New-Delhi in August (Summer)

(4) Srinagar, Jammu and Kashmir in January

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. Photochemical smog occurs in warm, dry and sunny climate.

64. Which one of the following is not an example of calcination ?

(1) $Fe_2O_3 \cdot xH_2O \xrightarrow{\Delta} Fe_2O_3 + xH_2O$

(2) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

(3) $CaCO_3 \cdot MgCO_3 \xrightarrow{\Delta} CaO + MgO + 2CO_2$

(4) $2PbS + 3O_2 \xrightarrow{\Delta} 2PbO + 2SO_2$

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. $2\ PbS + 3\ O_2(g) \xrightarrow{\Delta} 2\ PbO + 2\ SO_2(g)$

It is a roasting reaction.

65. Consider the following statements:

(A) NF_3 molecule has a trigonal planar structure.

(B) Bond length of N_2 is shorter than O_2.

(C) Isoelectronic molecules or ions have identical bond order.

(D) Dipole moment of H_2S is higher than that of water molecule.

Choose the correct answer from the option below:

(1) (A) and (D) are correct

(2) (C) and (D) are correct

(3) (A) and (B) are correct

(4) (B) and (C) are correct

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. (A) NF_3 has trigonal pyramidal shape.

(B) Bond order $\Rightarrow N_2 > O_2$

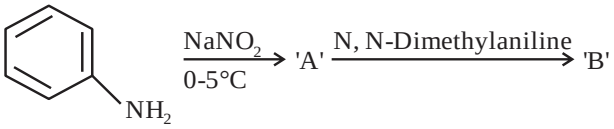
Bond length $\Rightarrow N_2 < O_2$

$\Rightarrow$ (C)

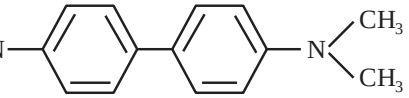
(D) Dipole moment $H_2O > H_2S$

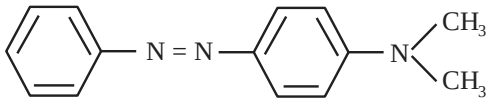
Due to Electronegativity difference.

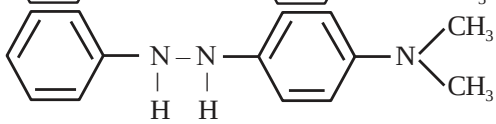
66. Consider the following sequence of reactions:

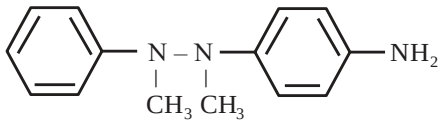


The product 'B' is

(1) H_2NHN 

(2) 

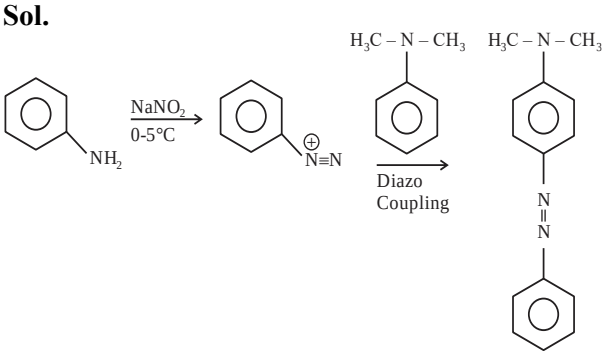
(3) 

(4) 

Official Ans. by NTA (2)

Allen Ans. (2)

Sol.



67. The number of P – O – P bonds in $H_4P_2O_7$, $(HPO_3)_3$ and P_4O_{10} are respectively.

(1) 1, 3, 6

(2) 0, 3, 6

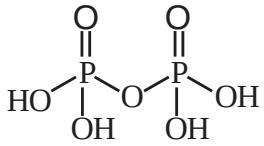
(3) 0, 3, 4

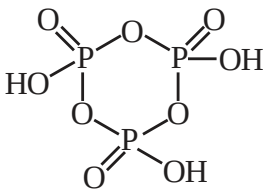
(4) 1, 2, 4

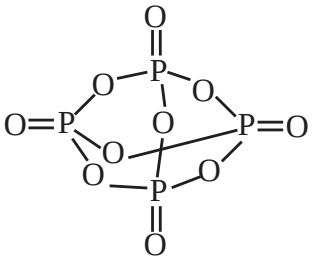
Official Ans. by NTA (1)

Allen Ans. (1)

Sol.







Molecule	Number of P-O-P Bond
$H_4P_2O_7$	1
$(HPO_3)_3$	3
P_4O_{10}	6

68. Given below are two statements:

Statement I: According to Bohr's model of hydrogen atom, the angular momentum of an electron in a given stationary state is quantised.

Statement II : The concept of electron in Bohr's orbit, violates the Heisenberg uncertainty principle.

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 correct but Statement II is incorrect.

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

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

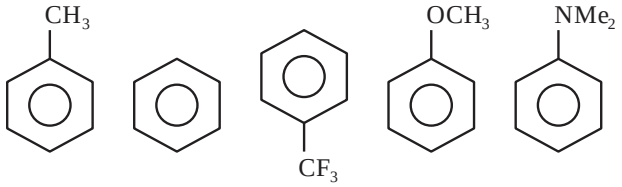
Official Ans. by NTA (1)

Allen Ans. (1)

Sol. According to Bohr's model the angular momentum is quantised and equal to $\frac{nh}{2\pi}$.

Heisenberg uncertainty principle explains orbital concept, which is based on probability of finding electron.

69. Decreasing order of reactivity towards electrophilie substitution for the following compounds is :



(a) (b) (c) (d) (e)

(1) c > b > a > d > e

(2) e > d > a > b > c

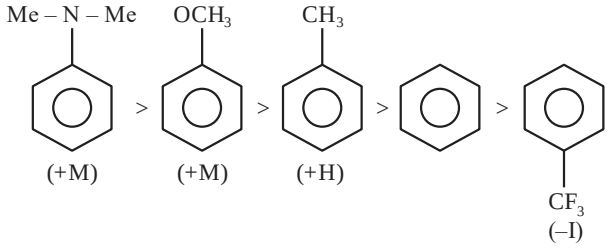
(3) a > d > e > b > c

(4) d > a > e > c > b

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. Higher the electron density on Benzene Ring, Higher its Reactivity towards electrophilic substitution Reaction



70. Which of the following statement(s) is/are correct?

(A) The pH of 1×10^{-8} M HCl solution is 8.

(B) The conjugate base $H_2PO_4^-$ is HPO_4^{2-}.

(C) K_w increases with increase in temperature.

(D) When a solution of weak monoprotic acid is titrated against a strong base at half neutralisation point, $pH = \frac{1}{2}pK_a$

Choose the correct answer from the option given below.

(1) (B), (C), (D)

(2) (A), (D)

(3) (A), (B), (C)

(4) (B), (C)

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. (A) pH of 10^{-8} M HCl is in acidic range (6.98).

(B) Conjugate Base of $H_2PO_4^-$ is HPO_4^{2-}

(C) K_w increases with increasing Temperature, as the temperature increases, the dissociation of water increases.

(D) At half neutralisation point, half of the acid is present in the form of salt.

$$pH = Pk_a + \log\frac{1}{1} = Pk_a$$

71. Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R :

Assertion (A) : $BeCl_2$ and $MgCl_2$ produce characteristic flame.

Reason (R) : The excitation energy is high in $BeCl_2$ and $MgCl_2$

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

(1) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)

(2) (A) is false but (R) is true

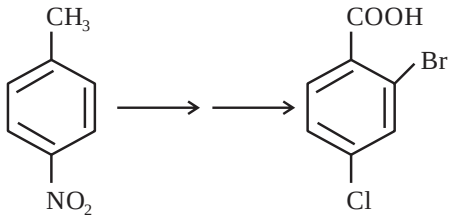
(3) Both (A) and (R) are true and (R) is the correct explanation of (A)

(4) (A) is true but (R) is false.

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. Be, Mg do not give colour to flame due to high excitation energy.

72. 

In the above conversion the correct sequence of reagents to be added is

(1) (i) Fe/H^+, (ii) HONO, (iii) CuCl, (iv) $KMnO_4$, (v) Br_2

(2) (i) $KMnO_4$, (ii) Br_2/Fe, (iii) Fe/H^+, (iv) Cl_2

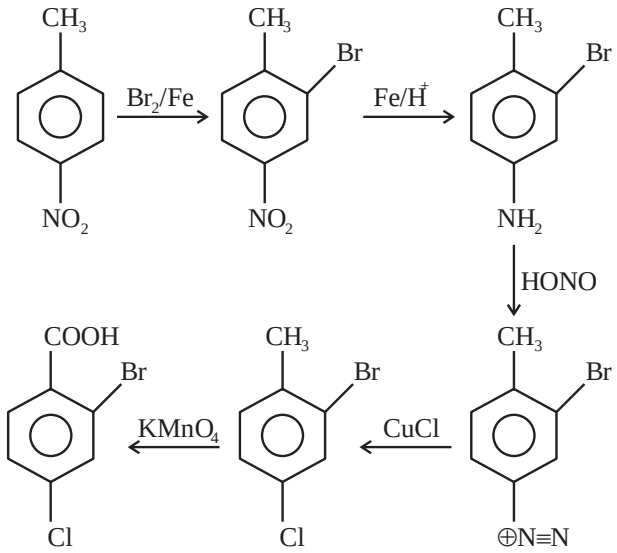
(3) (i) Br_2/Fe, (ii) Fe/H^+, (iii) HONO, (iv) CuCl, (v) $KMnO_4$

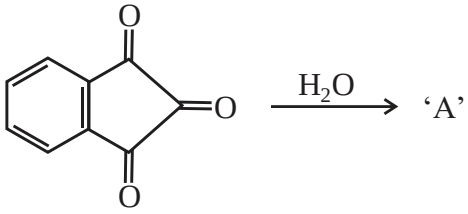
(4) Br_2/Fe, (ii) Fe/H^+, (iii) $KMnO_4$, (iv) Cl_2

Official Ans. by NTA (3)

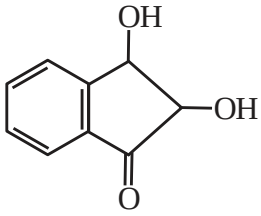
Allen Ans. (3)

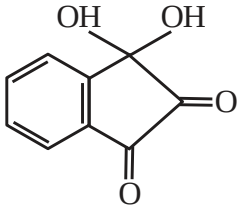
Sol.

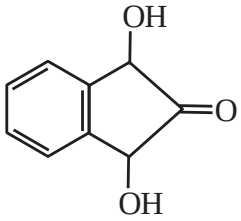


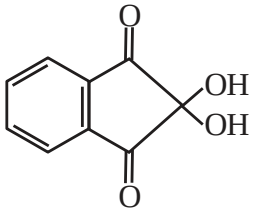
73. 

major product 'A' formed in the above reaction is

(1) 

(2) 

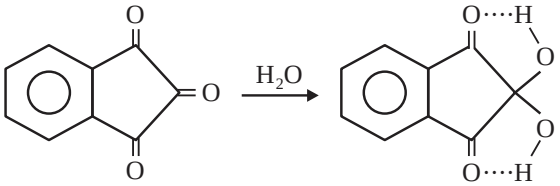
(3) 

(4) 

Official Ans. by NTA (4)

Allen Ans. (4)

Sol.



74. Which is not true for arginine?

(1) It is a crystalline solid.

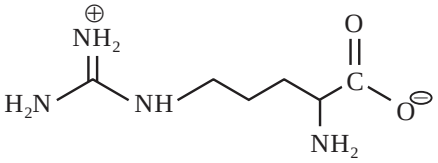
(2) It is associated with more than one pK_a values.

(3) It has a fairly high melting point.

(4) It has high solubility in benzene.

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. 

Arginine exist is zwitterion, so solid in nature and soluble in polar solvent.

75. During water-gas shift reaction

(1) carbon monoxide is oxidized to carbon dioxide.

(2) carbon is oxidized to carbon monoxide.

(3) carbon dioxide is reduced to carbon monoxide.

(4) water is evaporated in presence of catalyst.

Official Ans. by NTA (1)

Allen Ans. (1)

Sol. Water gas shift reaction

$$\underbrace{CO(g) + H_2}_{\text{water gas}} + \underbrace{H_2O}_{\text{Steam}} \xrightarrow[\text{Catalyst}]{\text{Iron Chromate}} CO_2(g) + 2H_2(g)$$

76. For a good quality cement, the ratio of silica to alumina is found to be

(1) 3

(2) 4.5

(3) 2

(4) 1.5

Official Ans. by NTA (1)

Allen Ans. (1)

Sol. For good quality cement, the ratio of silica (SlO_2) to Alumina (Al_2O_3) should be between 2.5 to 4.

77. Which of the following statement is correct for paper chromatography ?

(1) Water present in the mobile phase gets absorbed by the paper which then forms the stationary phase.

(2) Water present in the pores of the paper forms the stationary phase.

(3) Paper sheet forms the stationary phase.

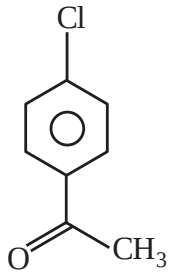
(4) Paper and water present in its pores together form the stationary phase.

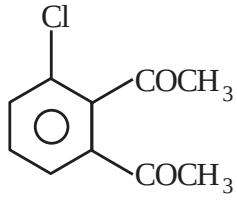
Official Ans. by NTA (2)

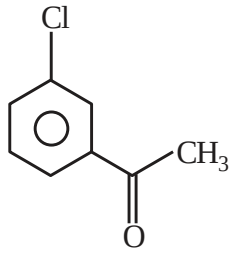
Allen Ans. (2)

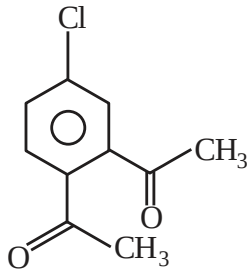
Sol. In paper chromatography, a special quality paper known as chromatography paper is used. Paper contains water trapped in it, which acts as the stationary phase.

78. The major product formed in the Friedel-Craft acylation of chlorobenzene is .

(1) 

(2) 

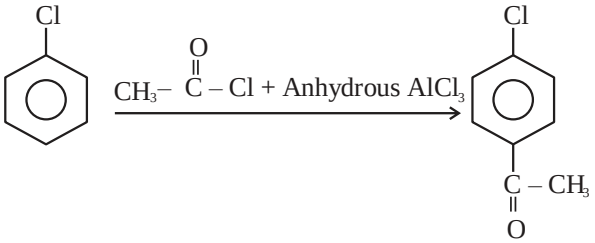
(3) 

(4) 

Official Ans. by NTA (1)

Allen Ans. (1)

Sol.



Chlorine is ortho/para directing, para is major.

79. The complex with highest magnitude of crystal field splitting energy (Δ_o) is

(1) $[Cr(OH_2)_6]^{3+}$

(2) $[Ti(OH_2)_6]^{3+}$

(3) $[Fe(OH_2)_6]^{3+}$

(4) $[Mn(OH_2)_6]^{3+}$

Official Ans. by NTA (1)

Allen Ans. (4)

Sol. Data based

80. Which of the following expressions is correct in case of a CsCl unit cell (edge length'a')?

(1) $r_{Cs^+} + r_{Cl^-} = \frac{a}{\sqrt{2}}$

(2) $r_{Cs^+} + r_{Cl^-} = a$

(3) $r_{Cs^+} + r_{Cl^-} = \frac{\sqrt{3}}{2}a$

(4) $r_{Cs^+} + r_{Cl^-} = \frac{a}{2}$

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. For CsCl, $Cs^{\oplus}$ is present at Body centre and Cl^{Θ} at all corner. $\frac{\sqrt{3}a}{2} = r_{cs^{\oplus}} + r_{Cl^{\Theta}}$

SECTION-B

81. The homoleptic and octahedral complex of Co^{2+} and H_2O has_____unpaired electron(s) in the t_{2g} set of orbitals.

Official Ans. by NTA (1)

Allen Ans. (1)

Sol. Co^{2+} : $3d^7$ configuration

t_{2g}^{221} e_g^{11}

82. The volume (in mL) of 0.1 M $AgNO_3$ required for complete precipitation of chloride ions present in 20 mL of 0.01 M solution of $[Cr(H_2O)_5Cl]Cl_2$ as silver chloride is_____

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. $[Cr(H_2O)_5Cl]Cl_2 + 2\ AgNO_3 \rightarrow$

0.01M, 20mL 0.1M

For 0.2 milimole $AgNO_3$ required

= 0.4 milimole

$0.4 = 0.1 \times V(ml)$

$V = 4mL$

83. The total change in the oxidation state of manganese involved in the reaction of $KMnO_4$ and potassium iodide in the acidic medium is_____

Official Ans. by NTA (5)

Allen Ans. (5)

Sol. $KMnO_4 \rightarrow Mn^{2+}$

$\downarrow \quad \downarrow$

+7 +2

Change in oxidation state of Mn= 5

84. In Chromyl chloride, the oxidation state of chromium is (+)_____

Official Ans. by NTA (6)

Allen Ans. (6)

Sol. $CrO_2Cl_2 x - 4 - 2 = 0$

Oxidation State = +6

85. The total number of isoelectronic species from the given set is _____

$O^{2-}, F^-, Al, Mg^{2+}, Na^+, O^+, Mg, Al^{3+}, F$

Official Ans. by NTA (5)

Allen Ans. (5)

Sol. Isoelectronic species $O^{2\Theta}, F^{\Theta}, Mg^{2+}, Na^{\oplus}, Al^{3+}$

86. The vapour pressure of 30% (w/v) aqueous solution of glucose is_____mm Hg at 25°C.

[Given : The density of 30% (w/v), aqueous solution of glucose is 1.2 g cm^{-3} and vapour pressure of pure water is 24 mm Hg.]

(Molar mass of glucose is 180 g mol^{-1}.)

Official Ans. by NTA (23)

Allen Ans. (23)

Sol. $\frac{24 - P_s}{P_s} = \frac{m \times 18}{1000}$

wt of solute = 30 gm

Volume of solution = 100 mL

wt. of solution = 1.2 × 100 = 120 gm

wt. of solvent = 120 – 30 = 90 gm

$$m = \frac{30 \times 1000}{180 \times 90} = 1.85$$

$$\frac{24 - P_s}{P_s} = \frac{1.85 \times 18}{1000}$$

$24 - P_s = 0.0333\ P_s$

$P_s(1.033) = 24$

$P_s = 23.22$

87. 20 mL of 0.5 M NaCl is required to coagulate 200 mL of As_2S_3 solution in 2 hours. The coagulating value of NaCl is _____

Official Ans. by NTA (50)

Allen Ans. (50)

Sol. Coagulating value is required milimole of electrolyte needed to coagulate 1 L sol in 2 hours.

$$\text{Coagulating value} = \frac{20 \times 0.5}{200} \times 1000 = 50$$

88. For a reversible reaction $A \rightleftharpoons B$, the $\Delta H_{\text{forward reaction}} = 20$ kJ mol^{-1}. The activation energy of the uncatalysed forward reaction is 300 kJ mol^{-1}. When the reaction is catalysed keeping the reactant concentration same, the rate of the catalysed forward reaction at 27°C is found to be same as that of the uncatalysed reaction at 327°C. The activation energy of the cataysed backward reactoion is _____kJ mol^{-1}.

Official Ans. by NTA (130)

Allen Ans. (130)

Sol. $E_a = 300$ kJ mol^{-1}

$$\frac{E_a}{T} = \frac{E_a'}{T'}$$

(Since rate of catalysed and uncatalysed reaction is same)

$$\frac{300}{600} = \frac{E'_{a,f}}{300}$$

$$E'_{a,f} = 150$$

$$20 = 150 - E'_{a,b}$$

$$E'_{a,b} = 130$$

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

(A) Conductivity always decreases with decrease in concentration for both strong and weak electrolytes.

(B) The number of ions per unit volume that carry current in a solution increases on dilution.

(C) Molar conductivity increases with decrease in concentration.

(D) The variation in molar conductivity is different for strong and weak electrolytes.

(E) For weak electrolytes, the change in molar conductivity with dilution is due to decrease in degree of dissociation.

Official Ans. by NTA (3)

Allen Ans. (3)

Sol.

(A) Conductivity decreases with dilution for strong electrolyte as well as weak electrolyte.

(B) On dilution, The number of ions per unit volume that carry current in a solution decreases.

(C) Molar conductivity increases with dilution.

(D) Molar conductivity of strong electrolyte follows DHO equation but it is not applicable for weak electrolyte.

(E) On dilution degree of dissociation of weak electrolyte increases.

So answer is (A), (C) & (D).

90. 30.4 kJ of heat is required to melt one mole of sodium chloride and the entropy change at the melting point is 28.4 J K^{-1} mol^{-1} at 1 atm. The melting point of sodium chloride is _____K (Nearest Integer)

Official Ans. by NTA (1070)

Allen Ans. (1070)

Sol. $$\Delta S = \frac{\Delta H}{T_{mp}}$$

$$28.4 = \frac{30.4 \times 1000}{T_{mp}}$$

$$T_{mp} = 1070.422\ \text{K}.$$