FINAL JEE-MAIN EXAMINATION - MARCH, 2021

(Held On Tuesday 16th March, 2021) TIME: 3:00 PM to 6:00 PM

CHEMISTRY

TEST PAPER WITH ANSWER & SOLUTION

SECTION-A

- 1. The green house gas/es is (are):
 - (A) Carbon dioxide
 - (B) Oxygen
 - (C) Water vapour
 - (D) Methane

Choose the most appropriate answer from the options given below :

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

Official Ans. by NTA (3)

- **Sol.** The green house gases are CO_2 , $H_2O_{(vapour)}$ & CH_4 .
- 2. CH₃ "A" COOH
 OCH₃ OCH₃

In the above reaction, the reagent "A" is:

- (1) NaBH₄, H₃O⁺
- (2) LiAlH₄
- (3) Alkaline KMnO₄, H⁺
- (4) HCl, Zn-Hg

Official Ans. by NTA (3)

Sol.
$$OCH_3$$
 "A" OCH_3

$$\begin{array}{c}
CH_{3} \\
AlkalineKMnO_{4} \\
H^{\dagger}
\end{array}$$

$$\begin{array}{c}
COOH \\
OCH_{3}
\end{array}$$

- **3.** Which of the following reduction reaction CANNOT be carried out with coke ?
 - (1) $Al_2O_3 \rightarrow Al$
 - (2) ZnO \rightarrow Zn
 - (3) $Fe_2O_3 \rightarrow Fe$
 - (4) $Cu_2O \rightarrow Cu$

Official Ans. by NTA (1)

Sol. Reduction of $Al_2O_3 \rightarrow Al$ is carried out by

4. Identify the elements X and Y using the ionisation energy values given below:

	Ionization energy	(kJ/mol)
	1 st	2^{nd}
X	495	4563
Y	731	1450

- (1) X = Na ; Y = Mg
- (2) X = Mg ; Y = F
- (3) X = Mg; Y = Na
- (4) X = F; Y = Mg

Official Ans. by NTA (1)

Sol. Na \rightarrow [Ne] 3s¹ IE₁ is very low but IE₂ is very high due to stable noble gas configuration of Na⁺.

 $Mg \rightarrow [Ne] 3s^2 IE_1 \& IE_2 \rightarrow Low IE_3 is very high.$

Identify the reagent(s) 'A' and condition(s) for the reaction :

- (1) A = HCl; Anhydrous $AlCl_3$
- (2) $A = HCl, ZnCl_2$
- (3) $A = Cl_2$; UV light
- (4) $A = Cl_2$; dark, Anhydrous $AlCl_3$

Official Ans. by NTA (3)

Sol.
$$\bigcirc \xrightarrow{\text{"A"}} \bigcirc \stackrel{\text{Cl}}{\longleftrightarrow}$$

For substitution at allylic position in the given compound, the reagent used is Cl_2/uv light. The reaction is free radical halogenation.

$$\begin{array}{c}
Cl \\
\hline
UV \ light
\end{array}$$

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- **6.** The secondary structure of protein is stabilised by:
 - (1) Peptide bond
 - (2) glycosidic bond
 - (3) Hydrogen bonding
 - (4) van der Waals forces

Official Ans. by NTA (3)

- **Sol.** The secondary structure of protein includes two type:
 - (a) α-Helix
- (b) β -pleated sheet

In α -Helix structure, the poly peptide chain is coil around due to presence of Intramolecular H-Bonding.

- 7. Fex_2 and Fey_3 are known when x and y are :
 - (1) x = F, Cl, Br, I and y = F, Cl, Br
 - (2) x = F, Cl, Br and y = F, Cl, Br, I
 - (3) x = Cl, Br, I and y = F, Cl, Br, I
 - (4) x = F, Cl, Br, I and y = F, Cl, Br, I

Official Ans. by NTA (1)

Sol. $2\text{FeI}_3 \longrightarrow 2\text{FeI}_2 + \text{I}_2$ (Stable)

Due to strong reducing nature of Γ

$$2Fe^{3+} + 2I^{-} \longrightarrow 2Fe^{2+} + I_{2}$$

remaining halides of Fe²⁺ & Fe³⁺ are stable.

- **8.** Which of the following polymer is used in the manufacture of wood laminates ?
 - (1) cis-poly isoprene
 - (2) Melamine formaldehyde resin
 - (3) Urea formaldehyde resin
 - (4) Phenol and formaldehyde resin

Official Ans. by NTA (3)

- **Sol.** Urea –HCHO resin is used in manufacture of wood laminates.
- **9. Statement I:** Sodium hydride can be used as an oxidising agent.

Statement II: The lone pair of electrons on nitrogen in pyridine makes it basic.

Choose the CORRECT answer from the options given below:

- (1) Both statement I and statement II are false
- (2) Statement I is true but statement II is false
- (3) Statement I is false but statement II is true
- (4) Both statement I and statement II are true Official Ans. by NTA (3)
- **Sol.** (1) NaH (sodium Hydride) is used as a reducing reagent.
 - (2) \bigcap_{N} In pyridine, due to free electron on

- 10. The INCORRECT statement regarding the structure of C_{60} is :
 - (1) The six-membered rings are fused to both six and five-membered rings.
 - (2) Each carbon atom forms three sigma bonds.
 - (3) The five-membered rings are fused only to six-membered rings.
 - (4) It contains 12 six-membered rings and 24 five-membered rings.

Official Ans. by NTA (4)

Sol. Structure of C_{60}



It contain 20 hexagons 20 and 12 pentagons

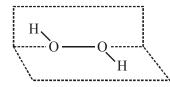
- (12) so option 4 is incorrect.
- 11. The correct statements about H_2O_2 are :
 - (A) used in the treatment of effluents.
 - (B) used as both oxidising and reducing agents.
 - (C) the two hydroxyl groups lie in the same plane.
 - (D) miscible with water.

Choose the correct answer from the options given below:

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

Official Ans. by NTA (2)

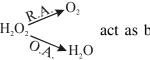
Sol.



Structure of H₂O₂

(Open book type) \rightarrow Non planar

H₂O₂ is used in the treatment of effluents.



act as both O.A & R.A.

Sol.

- 12. Ammonolysis of Alkyl halides followed by the treatment with NaOH solution can be used to prepare primary, secondary and tertiary amines. The purpose of NaOH in the reaction is:
 - (1) to remove basic impurities
 - (2) to activate NH₃ used in the reaction
 - (3) to remove acidic impurities
 - (4) to increase the reactivity of alkyl halide

Official Ans. by NTA (3)

alkyl halide
$$\begin{array}{c}
R-X + NH_{3} \longrightarrow [R-NH_{3}] X \\
R-X + NH_{3} \longrightarrow [R-NH_{3}] X \\
NH \longrightarrow R-NH + NaX + H_{2}O \\
NaOH$$

$$\begin{array}{c}
R-X + NH_{3} \longrightarrow [R-NH_{3}] X \\
R-X + NAX + H_{2}O
\end{array}$$

$$\begin{array}{c}
R-NH-R + NaX + H_{2}O \\
2^{\circ} \text{ amine} \\
R-X \longrightarrow R
\end{array}$$

$$\begin{array}{c}
H \\
[R-N^{+}-R] X \longrightarrow NaOH \\
R \longrightarrow R_{3}N + NaX + H_{2}O
\end{array}$$

So the purpose of NaOH in the above reactions in to remove acidic impurities.

13. An unsaturated hydrocarbon X on ozonolysis gives A. Compound A when warmed with ammonical silver nitrate forms a bright silver mirror along the sides of the test tube. The unsaturated hydrocarbon X is:

(1)
$$CH_3 - C = C - CH_3$$

 $CH_3 CH_3$

(2)
$$CH_3$$
– $C=$

(3) $HC \equiv C - CH_2 - CH_3$

(4)
$$CH_3-C\equiv C-CH_3$$

Sol. (X) $\xrightarrow{\text{Ozonolysis}}$ (A) $\xrightarrow{\text{Ammonical}}$ $\xrightarrow{\text{AgNO}_3}$ $\xrightarrow{\text{silver}}$ $\xrightarrow{\text{Hydrocarbon}}$ (Tollen's mirror)

As (A) compound given positive tollen's test hence it may consist—CHO (aldehyde group). or it can be HCOOH
So for the given option:

and for other compounds (options):

(1)
$$CH_3$$
 $C = C$ CH_3 CH

(2)
$$CH_3$$
 $C = CH_3$ $C = CH_3$ CH_3 $C = CH_3$ (Both do not show tollen's test)

- **14.** Which of the following is least basic?
 - (1) (CH₃CO) NHC₂H₅
 - (2) $(C_2H_5)_3\ddot{N}$
 - (3) (CH₃CO)₂ NH
 - $(4) (C_2H_5)_2\ddot{N}H$

Official Ans. by NTA (3)

- **Sol.** For the given compounds:
 - (1) CH₃-C-NH-C₂H₅; L.P. on Nitrogen is delocalised.
 - (2) CH₃CH₂-N-CH₂CH₃; L.P. on Nitrogen is CH₂CH₃

localised.

(3) $CH_3-C-\vec{N}H-C-CH_3$; L.P. on Nitrogen is

delocalised due to conjugation with both -C-

(Hence least basic)

(4) CH₃-CH₂-NH-CH₂-CH₃; L.P. on Nitrogen



- **15.** The characteristics of elements X, Y and Z with atomic numbers, respectively, 33, 53 and 83 are :
 - (1) X and Y are metalloids and Z is a metal.
 - (2) X is a metalloid, Y is a non-metal and Z is a metal.
 - (3) X, Y and Z are metals.
 - (4) X and Z are non-metals and Y is a metalloid

Official Ans. by NTA (2)

- **Sol.** $X = {}_{33}As \rightarrow Metalloid$
 - $Y = {}_{53}I \rightarrow Nonmetal$
 - $Z = {}_{83}Bi \rightarrow Metal$
- 16. Match List-II with List-II

List-I Test/Reagents/Observation(s)

List-II Species detected

- (a) Lassaigne's Test
- (i) Carbon
- (b) Cu(II) oxide
- (ii) Sulphur
- (c) Silver nitrate
- (iii) N, S, P, and halogen
- (d) The sodium fusion extract gives black precipitate with acetic acid and lead acetate
- (iv) Halogen Specifically

The correct match is:

- (1) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
- (2) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)
- (3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
- (4) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)

Official Ans. by NTA (3)

Sol. Match list :-

(a) Lassaigne's Test	(iii) N, S, P and Halogen	
(b) Cu(II) Oxide	(i) Carbon	
(c) AgNO ₃	(iv) Halogen specifically.	
(d) Sodium fusion extract given black precipitate with acetic acid and lead acetate (CH ₃ COOH/(CH ₃ COO) ₂ Pb)	(ii) Sulphur	

- **17.** The INCORRECT statements below regarding colloidal solutions is :
 - (1) A colloidal solution shows colligative properties.
 - (2) An ordinary filter paper can stop the flow of colloidal particles.
 - (3) The flocculating power of Al^{3+} is more than that of Na^+ .
 - (4) A colloidal solution shows Brownian motion of colloidal particles.

Official Ans. by NTA (2)

- **Sol.** * Colloidel solution exhibits colligative properties
 - * An ordinary filter can not stop the flow of colloidal particles.
 - * Flocculating power increases with increase the opposite charge of electrolyte.
 - * Colloidal particles show brownian motion.
- 18. Arrange the following metal complex/compounds in the increasing order of spin only magnetic moment. Presume all the three, high spin system.

(Atomic numbers Ce = 58, Gd = 64 and Eu = 63.)

- (a) $(NH_4)_2[Ce(NO_3)_6]$ (b) $Gd(NO_3)_3$ and
- (c) $Eu(NO_3)_3$

Answer is:

- (1) (b) < (a) < (c)
- (2) (c) < (a) < (b)
- (3) (a) < (b) < (c)
- (4) (a) < (c) < (b)

Official Ans. by NTA (4)

- Sol. (a) $_{58}\text{Ce} \rightarrow [\text{Xe}]4\text{f}^2 5\text{d}^0 6\text{s}^2$ In complex $\text{Ce}^{4+} \rightarrow [\text{Xe}] 4\text{f}^0 5\text{d}^0 6\text{s}^0$ there is no unpaired electron so $\mu_m = 0$
 - (b) $_{64}Gd^{3+} \rightarrow [Xe]4f^7 5d^0 6s^0$ contain seven unpaired electrons so,

$$\mu_{\rm m} = \sqrt{7(7+2)} = \sqrt{63} \text{ B.M.}$$

(c) $_{63}Eu^{3+} \rightarrow [_{54}Xe]4f^6 5d^0 6s^0$

contain six unpaired electron

so,
$$\mu_{\rm m} = \sqrt{6(6+2)} = \sqrt{48}$$
 B.M.

Hence, order of spin only magnetic movement

- required to neutralise 50 mL of 1 M H₃PO₃ solution and 100 mL of 2 M H₃PO₂ solution, respectively, are:
 - (1) 100 mL and 100 mL
 - (2) 100 mL and 50 mL
 - (3) 100 mL and 200 mL
 - (4) 50 mL and 50 mL

Official Ans. by NTA (3)

Sol.
$$H_3PO_3 + 2NaOH \rightarrow Na_2HPO_3 + 2H_2O$$

50 ml 1M
1M V = ?

$$\Rightarrow \frac{n_{\text{NaoH}}}{n_{\text{H}_3\text{PO}_3}} = \frac{2}{1}$$

$$\Rightarrow \frac{1 \times V}{50 \times 1} = \frac{2}{1} \Rightarrow V_{\text{NaOH}} = 100 \,\text{ml}$$

 $H_3PO_2 + 2NaOH \rightarrow NaH_2PO_3 + H_2O$ 100 ml 1M2M V = ?

$$\Rightarrow \frac{n_{\text{NaoH}}}{n_{\text{H}_3\text{PO}_3}} = \frac{1}{1} \quad \Rightarrow \frac{1 \times V}{2 \times 100} = \frac{1}{1} \Rightarrow \boxed{V_{\text{NaOH}} = 200 \, \text{ml}}$$

20.
$$(i) C_0H_5MgBr Ether (1.0 equivalent), dry X Major Product$$

$$(ii) H_3O^{T} Major Product$$

The structure of X is:

1)
$$NH_2$$
 (2) NH_2 OCH₃

$$(3) \bigcirc C_6H_5 \qquad (4) \bigcirc C_6H_5$$

$$C_6H_5 \qquad OCH_3$$

Official Ans. by NTA (4)

Sol.
$$\begin{array}{c|c}
 & \delta - \delta + \\
 & PhMgBr \\
\hline
 & OCH_3
\end{array}$$

$$\begin{array}{c|c}
 & OCH_3
\end{array}$$

$$\begin{array}{c|c}
 & Ph \\
\hline
 & Ph \\
\hline
 & C=O \\
\end{array}$$

$$\begin{array}{c|c}
 & Ph \\
\hline
 & C=N^-MgBr
\end{array}$$

$$\begin{array}{c|c}
 & OCH_3
\end{array}$$

$$\begin{array}{c|c}
 & Ph \\
\hline
 & C=NH
\end{array}$$

$$\begin{array}{c|c}
 & Ph \\
\hline
 & C=NH
\end{array}$$

$$\begin{array}{c|c}
 & Ph \\
\hline
 & Ph \\
\hline
 & C=NH
\end{array}$$

SECTION-B

Ga (atomic mass 70 u) crystallizes in a hexagonal close packed structure. The total number of voids in 0.581 g of Ga is _____ × 10²¹. (Round off to the Nearest Integer).

Official Ans. by NTA (15)

Sol. HCP structure: Per atom, there will be one octahedral void (OV) and two tetrahedral voids (TV).

Therefore total three voids per atom are present in HCP structure.

→ therefore total no of atoms of Ga will be-

$$=\frac{Mass}{Molar Mass} \times N_A = \frac{0.581g}{70g / mol} \times 6.023 \times 10^{23}$$

 \rightarrow Now, total Number of voids = 3 × total no. of atoms

$$= 3 \times \frac{0.581}{70} \times 6.023 \times 10^{23} = 14.99 \times 10^{21}$$

2. A 5.0 m mol dm⁻³ aqueous solution of KCl has a conductance of 0.55 mS when measured in a cell constant 1.3 cm⁻¹. The molar conductivity of this solution is _____ mSm² mol⁻¹.

(Round off to the Nearest Integer)

Official Ans. by NTA (14)

Sol. Given concⁿ of KC1 = $\frac{\text{m.mol}}{L}$

: Conductance (G) = 0.55 mS

: Cell constant $\left(\frac{\ell}{A}\right) = 1.3 \text{ cm}^{-1}$

To Calculate : Molar conductivity (λ_m) of sol.

$$\rightarrow$$
 Since $\lambda_{m} = \frac{1}{1000} \times \frac{k}{m}$ (1)

$$\rightarrow$$
 Molarity = 5 × 10⁻³ $\frac{\text{mol}}{\text{L}}$

$$\rightarrow \text{Conductivity} = G \times \left(\frac{\ell}{A}\right) = 0.55 \text{ mS} \times \frac{1.3}{\frac{1}{100}} \text{m}^{-1}$$

=
$$55 \times 1.3$$
 mSm⁻¹
eqⁿ (1) $\lambda_{m} = \frac{1}{1000} \times \frac{55 \times 1.3}{\left(\frac{5}{1000}\right)} \frac{\text{mSm}^{2}}{\text{mol}}$

$$mSm^2$$

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A and B decompose via first order kinetics with half-lives 54.0 min and 18.0 min respectively. Starting from an equimolar non reactive mixture of A and B, the time taken for the concentration of A to become 16 times that of B is _____ min. (Round off to the Nearest Integer).

Official Ans. by NTA (108)

- **Sol.** Given $t_2 = 54 \text{ min}$ $T_{1/2} = 18 \text{ min}$ B t = 0 'x' M t = 0 'x' M
- \Rightarrow To calculate : $[A_t] = 16 \times [B_t]$ (1) time = ?
- \Rightarrow For I order kinetic : $[A_t] = \frac{A_0}{(2)^n}$
 - $n \rightarrow no of Half lives$
- \Rightarrow Now from the relation (1) [A.] = $16 \times [B.]$
- $\Rightarrow \frac{x}{(2)^{n_1}} = \frac{x}{(2)^{n_2}} \times 16 \Rightarrow (2)^{n_2} = (2)^{n_1} \times (2)^4$
- $\Rightarrow n_2 = n_1 + 4 \qquad \Rightarrow \frac{t}{(t_{1/2})_2} = \frac{t}{(t_{1/2})_1} + 4$
- $\Rightarrow t\left(\frac{1}{18} \frac{1}{54}\right) = 4 \Rightarrow t = \frac{4 \times 18 \times 54}{36}$
- \Rightarrow $t = 108 \, \text{min}$
- 4. In Duma's method of estimation of nitrogen, 0.1840 g of an organic compound gave 30 mL of nitrogen collected at 287 K and 758 mm of Hg pressure. The percentage composition of nitrogen in the compound is _____. (Round off to the Nearest Integer).

[Given : Aqueous tension at 287 K = 14 mm of Hg]

Official Ans. by NTA (19)

Sol. In Duma's method of estimation of Nitrogen.
0.1840 gm of organic compound gave 30 mL
of nitrogen which is collected at 287 K & 758
mm of Hg.

Given;

Aqueous tension at 287 K = 14 mm of Hg. Hence actual pressure = (758 - 14)

Volume of nitrogen at STP =
$$\frac{273 \times 744 \times 30}{287 \times 760}$$

$$V = 27.935 \text{ mL}$$

- \therefore 22400 mL of N₂ at STP weighs = 28 gm.
- \therefore 27.94 mL of N₂ at STP weighs =

$$\left(\frac{28}{22400} \times 27.94\right) gm$$

= 0.0349 gm

Hence % of Nitrogen =
$$\left(\frac{0.0349}{0.1840} \times 100\right)$$

= 18.97 %

Rond off. Answer = 19 %

5. The number of orbitals with n = 5, $m_1 = +2$ is _____. (Round off to the Nearest Integer).

Official Ans. by NTA (3)

having $m_{\ell} = +2$

- Sol. For, n = 5 $\ell = (0, 1, 2, 3, 4)$ If $\ell = 0$, m = 0 $\ell = 1$, m = $\{-1, 0, +1\}$ $\ell = 2$, m = $\{-2, -1, 0, +1, +2\}$ $\ell = 3$, m = $\{-3, -2, -1, 0, +1, +2, +3\}$ $\ell = 4$, m = $\{-4, -3, -2, -1, 0, +1, +2, +3, +4\}$ 5d, 5f and 5g subshell contain one-one orbital
- At 363 K, the vapour pressure of A is 21 kPa and that of B is 18 kPa. One mole of A and 2 moles of B are mixed. Assuming that this solution is ideal, the vapour pressure of the mixture is _____ kPa. (Round of to the Nearest Integer).

Official Ans. by NTA (19)

Sol. Given $P_A^0 = 21kPa$ $\Rightarrow P_B^0 = 18kPa$ \Rightarrow An Ideal solution is prepared by mixing 1 mol A and 2 mol B.

$$\rightarrow$$
 $X_A = \frac{1}{3}$ and $X_B = \frac{2}{3}$

→ Acc to Raoult's low

$$P_{\mathrm{T}} = X_{\mathrm{A}} P_{\mathrm{A}}^{0} + X_{\mathrm{B}} P_{\mathrm{B}}^{0}$$

$$\Rightarrow P_{\mathrm{T}} = \left(\frac{1}{3} \times 21\right) + \left(\frac{2}{3} \times 18\right)$$

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- 7. Sulphurous acid (H_2SO_3) has $Ka_1 = 1.7 \times 10^{-2}$ and $Ka_2 = 6.4 \times 10^{-8}$. The pH of 0.588 M H_2SO_3 is ______. (Round off to the Nearest Integer)

 Official Ans. by NTA (1)
- Sol. H_2SO_3 [Dibasic acid] c = 0.588 M
- \Rightarrow pH of solution P due to First dissociation only since K_a , >> Ka_a
- ⇒ First dissociation of H₂SO₃

$$H_2SO_3(aq) \rightleftharpoons H^{\oplus}(aq) + HSO_3^{-}(aq) : ka_1 = 1.7 \times 10^{-2}$$

t = 0 C

t C-x

X

$$\implies$$
 $Ka_1 = \frac{1.7}{100} = \frac{[H^{\oplus}][HSO_3^-]}{[H_2SO_3]}$

$$\Rightarrow \frac{1.7}{100} = \frac{x^2}{(0.58 - x)}$$

- \Rightarrow 1.7 × 0.588 1.7x = 100 x²
- $\Rightarrow 100x^2 + 1.7x 1 = 0$
- $\Rightarrow [H^{\oplus}] = x = \frac{-1.7 + \sqrt{(1.7)^2 + 4 \times 100 \times 1}}{2 \times 100} = 0.09186$

Therefore pH of sol. is : pH = $-\log [H^{\oplus}]$

- \Rightarrow pH = -log (0.09186) = 1.036 \approx 1
- 8. When 35 mL of 0.15 M lead nitrate solution is mixed with 20 mL of 0.12 M chromic sulphate solution, $_____ \times 10^{-5}$ moles of lead sulphate precipitate out. (Round off to the Nearest Integer).

Official Ans. by NTA (525)

- **Sol.** 3 Pb $(NO_3)_2 + Cr_2 (SO_4)_3 \rightarrow 3PbSO_4 + 2Cr(NO_3)_3$ 35 ml 20 ml 0.15 M 0.12 M
- = 5.25 m.mol = 2.4 m.mol 5.25 m.mol = 5.25×10^{-3} mol therefore moles of PbSO₄ formed = 5.25×10^{-3} = 525×10^{-5}

(Round off to the Nearest Integer)

[Given : $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$. Assume, hydrogen is an ideal gas]

[Atomic mass off Fe is 55.85 u]

Official Ans. by NTA (2218)

$$\frac{50}{55.85}$$
 mol

- \rightarrow Work done for 1 mol gas
- $= -P_{ext} \times \Delta V$
- $= \Delta ng RT$
- $= -1 \times 8.314 \times 298 \text{ J}$
- \rightarrow Work done for $\frac{50}{55.85}$ mol of gas

$$= -1.8314 \times 298 \times \frac{50}{55.85}$$
J

- = -2218.059 J
- \simeq -2218 J
- 10. $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ absorbs light of wavelength 498 nm during a d d transition. The octahedral splitting energy for the above complex is _____ × 10^{-19} J. (Round off to the Nearest Integer). h = $6.626 \times 10^{-34} \text{ Js}$; c = $3 \times 10^8 \text{ ms}^{-1}$.

Official Ans. by NTA (4)

Sol. $\lambda_{absorbed} = 498 \text{ nm (given)}$ The octahedral spilitting energy

$$\Delta_0 \text{ or } E = \frac{hc}{\lambda} = \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{498 \times 10^{-9}}$$

$$= 0.0399 \times 10^{-17} \text{ J}$$