CHEMISTRY
JEE-MAIN (April-Attempt) 10
April (Shift-2) Paper

SECTION - A

1. The correct statement is :
(1) Aniline is a froth stabilizer
(2) Sodium cyanide cannot be used in the metallurgy of silver
(3) Zincite is a carbonate ore
(4) Zone refining process is used for the refining of titanium.

Sol. **2**
'Ra'

2. The correct statements among (a) to (d) are :
(a) Saline hydrides produce H_2 gas when reacted with H_2O
(b) reaction of $LiAlH_4$ with BF_3 leads to B_2H_6
(c) PH_3 and CH_4 are electron - rich and electron - precise hydrides, respectively.
(d) HF and CH_4 are called as molecular hydrides.
(1) (a), (c) and (d) only (2) (a), (b), (c) and (d)
(3) (c) and (d) only (4) (a), (b) and (c) only

Sol. **2**
Fact

3. Which of these factors does not govern the stability of a conformation in acyclic compounds ?
(1) Angle strain (2) Torsional strain
(3) Steric interactions (4) Electrostatic forces of interaction

Sol. **1**

4. The noble gas that does NOT occur in the atmosphere is :
(1) Kr (2) Ra (3) He (4) Ne

Sol. **2**
It should be Rn
Fact

5. The highest possible oxidation states of uranium and plutonium, respectively, are :
(1) 6 and 4 (2) 7 and 6 (3) 6 and 7 (4) 4 and 6

Sol. **3**
Fact

6. The difference between ΔH and ΔU ($\Delta H - \Delta U$), when the combustion of one mole of heptane(I) is carried out at a temperature T, is equal to :
(1) −3RT (2) 3RT (3) 4RT (4) −4RT

Sol. **4**
$C_7H_{16}(l) + 11O_2(g) \longrightarrow 7CO_2(g) + 8H_2O(l)$
$\therefore \quad \Delta H - \Delta U = \Delta ng\ RT$
$= -4 \times RT$
$= -4RT$

7. The INCORRECT statement is :
(1) The colour of $[CoCl(NH_3)_5]^{2+}$ is violet as it absorbs the yellow light.
(2) The spin-only magnetic moments of $[Fe(H_2O)_6]^{+2}$ and $[Cr(H_2O)_6]^{2+}$ are nearly similar.
(3) The spin-only magnetic moment of $[Ni(NH_3)_4(H_2O)_2]^{2+}$ is 2.83 BM.
(4) The gemstone, ruby, has Cr^{3+} ions occupying the octahedral sites of beryl

Sol. **4**
Chemical formula of Puby is Al_2O_3

8. The crystal field stabilization energy (CFSE) of $[Fe(H_2O)_6]Cl_2$ and $K_2[NiCl_4]$, respectively, are :
(1) $-0.4\Delta_0$ and $-0.8\Delta_t$ (2) $-0.6\Delta_0$ and $-0.8\Delta_t$
(3) $-2.4\Delta_0$ and $-1.2\Delta_t$ (4) $-0.4\Delta_0$ and $-1.2\Delta_t$

Sol. **1**

$(Fe(H_2O)_6)Cl_2 = t_2g^4eg^2$

$$CFSE = \frac{(-0.4\times 4 + .6\times 2)\Delta_0}{(-1.6+1.2)\Delta_0}$$

$= -0.4\ \Delta_0$

$K_2[NiCl_4] = eg^4t_2g^4$

$CFSE = (-0.6 \times 4 + 0.4 \times 4)\Delta t$

$= (-2.4 + 1.6)\Delta_t = -0.8\ \Delta t$

9. For the reaction of H_2 with I_2, the rate constant is 2.5×10^{-4} $dm^3\ mol^{-1}\ s^{-1}$ at 327°C and 1.0 $dm^3\ mol^{-1}\ s^{-1}$ at 527°C. The activation energy for the reaction, in kJ mol^{-1} is :
($R = 8.314\ J\ K^{-1}\ mol^{-1}$)
(1) 150 (2) 59 (3) 72 (4) 166

Sol. **4**

$$\log\frac{K_2}{K_1} = \frac{E_a}{2.303R}\left[\frac{T_2-T_1}{T_1T_2}\right]$$

$$\log\frac{1}{2.5\times 10^{-4}} = \frac{Ea}{2.303\times 8.314}\left(\frac{800-600}{800\times 600}\right)$$

$$-\log 5^2\times 10^{-5} = \frac{E_a}{2.303\times 8.314}\left(\frac{200}{800\times 600}\right)$$

$\Rightarrow E_a = [5-1.3979] \times 2.303 \times 8.314 \times 800 \times 3$

$= 165.5$

$\underline{\sim}$ 166 J/k-mol

10. Number of stereo centres present in linear and cyclic strucrtures of glucose are respectively :
(1) 4 & 4 (2) 5 & 5 (3) 5 & 4 (4) 4 & 5

Ans. **4**

11. The number of pentagons in C_{60} and trigons (triangles) in white phosphorus, respectively, are :
(1) 20 and 3 (2) 20 and 4 (3) 12 and 3 (4) 12 and 4

Sol. **4**

Fact

12. The correct option among the following is :
(1) Addition of alum to water makes it unfit for drinking.
(2) Brownian motion in colloidal solution is faster if the viscosity of the solution is very high.
(3) Colloidal medicines are more effective because they have small surface area.
(4) Colloidal particles in lyophoboic sols can be precipitated by electrophoresis.

Sol. **4**

factual

13. 1 g of a non-volatile non-electrolyte solute is dissolved in 100 g of two different solvents A and B whose ebullioscopic constants are in the ratio of 1 : 5. the ratio of the elevation in their boiling points. $\frac{\Delta T_b(A)}{\Delta T_b(B)}$, is :

(1) 1 : 0.2 (2) 1 : 5 (3) 10 : 1 (4) 5 : 1

Sol. **2**

$$\frac{\Delta T_b = ik_b m}{\Delta T_b = ik_b m} = \frac{1}{5}$$

14. The correct order of the first ionization enthalpies is :

(1) Mn < Ti < Zn < Ni (2) Ti < Mn < Ni < Zn

(3) Ti < Mn < Zn < Ni (4) Zn < Ni < Mn < Ti

Sol. **2**

Data based

15. The pH of a 0.02 M NH_4Cl solution will be [given $K_b(NH_4OH) = 10^{-5}$ and log 2 = 0.301]

(1) 4.65 (2) 2.65 (3) 4.35 (4) 5.35

Sol. **4**

$$pH = \frac{1}{2}[pKw - pk_b - \log c]$$

$$= \frac{1}{2}[14 - 5 - \log 0.02] = \frac{1}{2}[14 - 5 - 0.3010 + 2] = 5.349 = 5.35$$

16. In chromatography, which of the following statements is INCORRECT for R_f ?

(1) Higher R_f value means higher adsorption.

(2) R_f value is dependent on the mobile phase.

(3) R_f value depends on the type of chromatography.

(4) The value of R_f can not be more than one.

Sol. **1**

Factual

17. Which of the following is NOT a correct method of the preparation of benzylamine from cyanobenzene ?

(1) (i) HCl/H_2O (ii) $NaBH_4$

(2) (i) $LiAlH_4$ (ii) H_3O^+

(3) (i) $SnCl_2$ + HCl(gas) (ii) $NaBH_4$

(4) H_2/Ni

Sol. **1**

$$Ph{-}CN \longrightarrow PhCH_2NH_2$$
$$\downarrow Hv/H_2O$$
$$PhCOOH \xrightarrow{NaBH_4} X$$

18. The increasing order of nucleophilicity of the following nucleophiles is :

(a) $CH_3CO_2^{\ominus}$ (b) H_2O (c) $CH_3SO_3^{\ominus}$ (d) $\overset{\ominus}{O}H$

(1) (a) < (d) < (c) < (b) (2) (b) < (c) < (d) < (a)

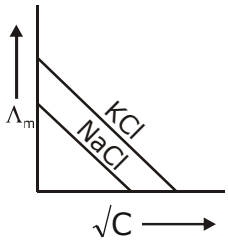
(3) (d) < (a) < (c) < (b) (4) (b) < (c) < (a) < (d)

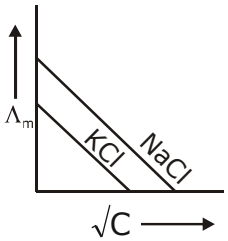
Sol. 4

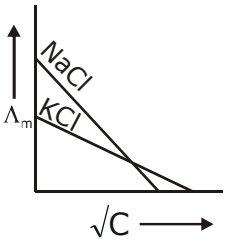
Nucleophteuty order

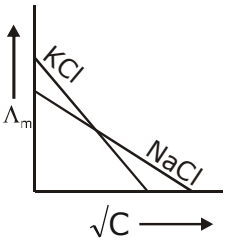
a > a > c > b

19. Which one of the following graphs between molar conductivity (Λ_m) versus $\sqrt{C}$ is correct ?

(1) 

(2) 

(3) 

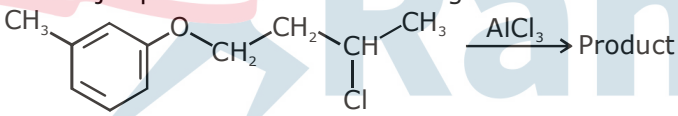
(4) 

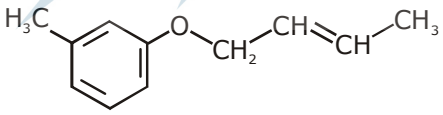
Sol 1

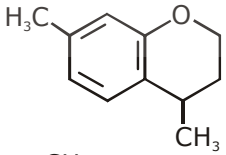
$\lambda_M^C = \lambda_M^\infty - b\sqrt{C}$

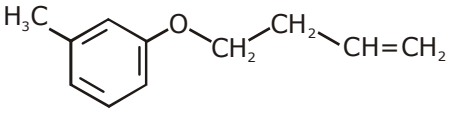
at ∞ dilution K^+ ion is highly solvated.

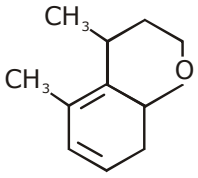
20. The major product obtained in teh given reaction is :



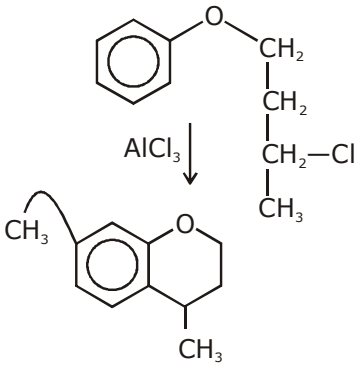
(1) 

(2) 

(3) 

(4) 

Sol. 2



21. The minimum amount of $O_2(g)$ consumed per gram of reactant is for the reaction :
(Given atomic mass : Fe = 56, O = 16, Mg = 24 P = 31 H = 1)
(1) $C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(I)$
(2) $P_4(s) + 5O_2(g) \rightarrow P_4O_{10}(s)$
(3) $4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s)$
(4) $2\ Mg(s) + O_2(g) \rightarrow 2MgO(s)$

Sol. **3**

(1) C_3H_8 + $5O_2$ $\longrightarrow$ d
44gm 160 gm

1 gm —— $\frac{160}{44}$ = 3.63gm

(2) P_4 + $5O_2$ $\longrightarrow$
124 gm 160 gm

1 gm —— $\frac{160}{124}$gm = 1.29 gm

(3) 4fe + $3O_2$ $\longrightarrow$
224 gm 96 gm

1gm —— $\frac{96}{224}$ = 0.428 gm

(4) 2Mg + O_2 $\longrightarrow$
48 gm 32gm

1gm —— $\frac{32}{48}$ = 0.66 gm

$\therefore$ (3)

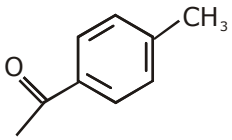
22. The correct match between Item–I and Item-II is :

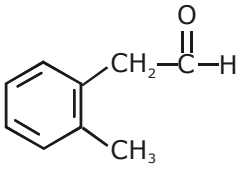
	Item - I		Item - II
(a)	High density polythene	(i)	Peroxide catalyst
(b)	Polyacrylonitrile	(ii)	Condensation at high temperature & pressure
(c)	Novolac	(iii)	Ziegler-Natta Catalyst
(d)	Nylon 6	(iv)	Acid or base catalyst

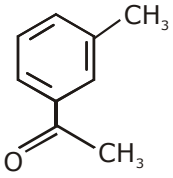
(1) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii) (2) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii) (4) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

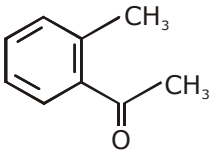
Sol. **3**

23. Compound A($C_9H_{10}O$) shows positive iodoform test. Oxidation of A with $KMnO_4$/KOH gives acid B($C_8H_6O_4$). Anhydride of B is used for the preparation of phenolphthalein. Compound A is:

(1) 

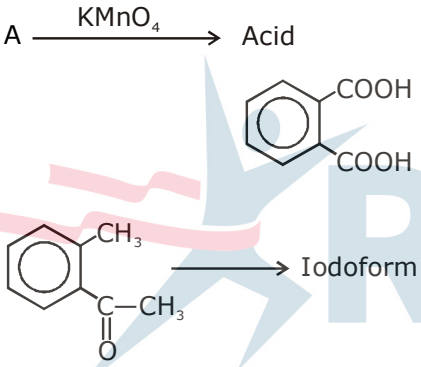
(2) 

(3) 

(4) 

Sol. **4**

A $\rightarrow$ Iodoform test



24. Air pollution that occurs in sunlight is:

(1) acid rain (2) reducing smog (3) oxidising smog (4) fog

Sol. **3**

factual

25. The ratio of the shortest wavelength of two spectral series of hydrogen spectrum is found to be about 9. The spectral series are:

(1) Paschen and Pfund (2) Lyman and Paschen

(3) Balmer and Brackett (4) Brackett and Pfund

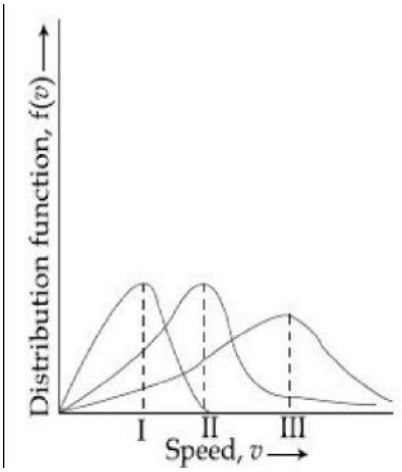
Sol. **2**

$$\lambda(\text{Å}) = \frac{12400}{\Delta E(\text{eV})}$$

(1) $= \frac{0.54}{1.51}$ (2) $= \frac{1.51}{13.6} = \frac{1}{9}$

(3) $= \frac{0.85}{3.4}$ (4) $\frac{0.54}{0.85}$

26. Points I, II and III in the following plot respectively correspond to (V_{mp} : most probable velocity)



(1) V_{mp} of H_2 (300K); V_{map} of N_2(300K); V_{mp} of O_2(400K)
(2) V_{mp} of N_2 (300K); V_{map} of O_2(400K); V_{mp} of H_2(300K)
(3) V_{mp} of N_2 (300K); V_{map} of H_2(300K); V_{mp} of O_2(400K)
(4) V_{mp} of O_2 (400K); V_{map} of N_2(300K); V_{mp} of H_2(300K)

Sol. **2**

$$U_{mps} = \sqrt{\frac{2RT}{MM}}$$

$$V_{mps} = \sqrt{\frac{2R \times 300}{2}} = \sqrt{300R}$$

$$V_{\underset{(N_2)}{MPS}} = \sqrt{\frac{3R \times 300}{28}} = \sqrt{\frac{300}{14}R} = \sqrt{21.4R}$$

$$V_{\underset{(O_2)}{MPS}} = \sqrt{\frac{2R \times 400}{32}} = \sqrt{25R}$$

III > II > I

$V_{H_2} > V_{O_2} > V_{N_2}$

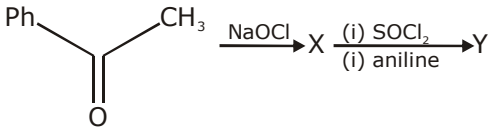
27. A hydrated solid X on heating initially gives a monohydrated compound Y. Y upon heating above 373K leads to an anhydrous white powder Z. X and Z, respectively, are:
(1) Baking soda and soda ash
(2) Baking soda and dead burnt plaster
(3) Washing soda and dead burnt plaster
(4) Washing soda and soda ash

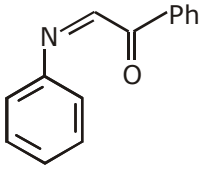
Sol. **4**

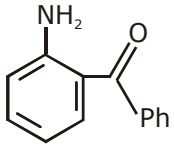
$Na_2CO_3.10H_2O \xrightarrow{\Delta} Na_2CO_3.H_2O \xrightarrow{373K} Na_2CO_3$

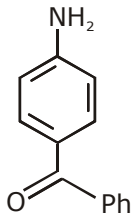
washing soda.

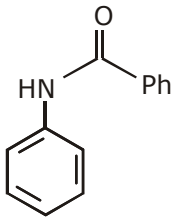
28. The major product 'Y' in the following reaction is:



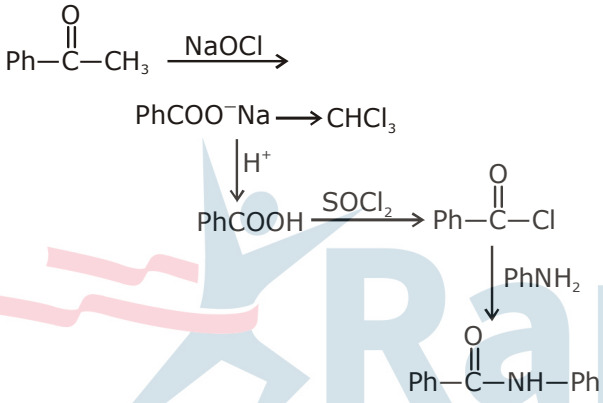
(1) 

(2) 

(3) 

(4) 

Sol. **4**



29. For the reaction,
$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$,
$\Delta H = -57.2$ kJ mol^{-1} and
$K_c = 1.7 \times 10^{16}$.
Which of the following statement is INCORRECT ?
(1) The equilibrium constant decreases as the temperature increases
(2) The equilibrium will shift in forward direction as the pressure increases
(3) The addition of inert gas at constant volume will not affect the equilibrium constant
(4) The equilibrium constant is large suggestive of reaction going to completion and so no catalyst is required

Sol. **(4)**

(1) $\ln\frac{k_f}{k_i} = \frac{\Delta H}{R}\left[\frac{T_f - T_i}{T_i T_f}\right]$

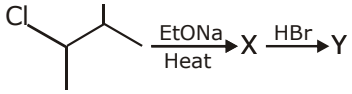
$-ve \quad +ve$

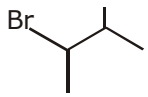
$\ln\frac{k_f}{k_i} = -ve$

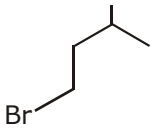
$\therefore k_i > k_f$

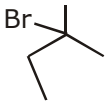
(2) on increasing pressure equilibrium will shift in forward direction
(3) No effect of addition of inert gas at constant volume
(4) No relation of catalyst with equilibrium constant.

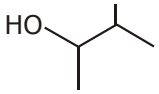
30. The major product 'Y' in the following reaction is:



(1) 

(2) 

(3) 

(4) 

Sol. **3**