JEE (MAIN)-2025 (Online)

Chemistry Memory Based Answer & Solutions

EVENING SHIFT

DATE : 23-01-2025

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MEMORY BASED QUESTIONS JEE–MAIN EXAMINATION – JANUARY, 2025

(Held On Thursday 23rd January, 2025) TIME : 03 : 00 PM to 06 : 00 PM

CHEMISTRY

TEST PAPER WITH SOLUTION

SECTION-A

1. The correct order of melting point of 14 group element is (K)

(1) C > Si > Ge > Sn > Pb

(2) Si > C > Ge > Sn > Pb

(3) Ge > Sn > C > Si > Pb

(4) C > Si > Ge > Pb > Sn

Ans. (4)

Sol.

	C	>	Si	>	Ge	>	Pb	>	Sn
(k)	4373		1693		1218		600		5053

2. What will be effect on pH of water when it is heated.

(1) Increase

(2) Decrease

(3) Remains same

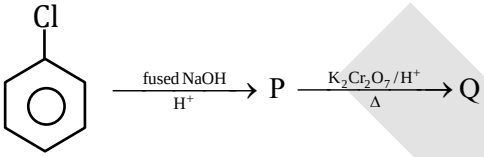
(4) pH first increases then decreases

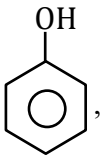
Ans. (2)

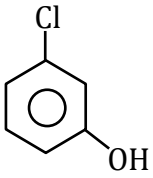
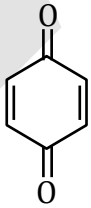
Sol. $H_2O \rightleftharpoons H^+ + OH^-$; $\Delta H = +ve$

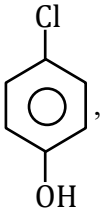
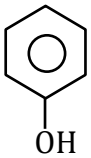
On increasing temperature dissociation of water increases , $[H^+]$ increases and pH decreases.

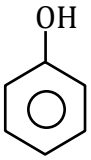
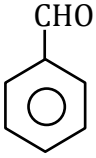
3. Identify P & Q.



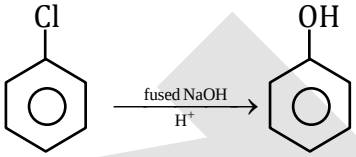
(1) P =  , Q = 

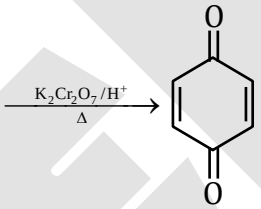
(2) P =  , Q = 

(3) P =  , Q = 

(4) P =  , Q = 

Ans. (1)

Sol. 



4. α-helix protein and β-pleated protein belongs to which of the following structure?

(1) Primary structure of protein

(2) secondary structure of protein

(3) Tertiary structure of protein

(4) Quaternary structure of protein

Ans. (2)

Sol. α-Helix protein and β-pleated protein belongs to secondary structure of protein, which have hydrogen bonds.

5. Statement-1: For a particular shell, maximum number of orbital is n^2.

Statement-2: For any subshell spatial arrangement lies between $-\ell$ to $+\ell$ including zero

(1) S-1 and S-2 both are correct

(2) S-1 and S-2 both are incorrect

(3) S-1 is correct and S-2 is incorrect

(4) S-1 is incorrect and S-2 is correct

Ans. (1)

Sol. Statement-1 : Correct

For a particular shell, maximum number of orbital is n^2.

Statement-2 : Correct

Magnetic quantum number (m) lies in the range from $-\ell$ to $+\ell$.

6. Match the following List-I with List-II

List-I		List-II	
(A)	Bronze	(i)	Fe, Cr and Ni
(B)	Stainless steel	(ii)	Cu and Sn
(C)	UK Gold coin	(iii)	Cu and Zn
(D)	Brass	(iv)	Ag, Cu, Zn and Ni

	A	B	C	D
(1)	(ii)	(i)	(iv)	(iii)
(2)	(i)	(ii)	(iii)	(iv)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(ii)	(i)

Ans. **(1)**

Sol.

Composition		
Bronze	-	Cu and Sn
Brass	-	Cu and Zn
Stainless steel	-	Fe, Cr and Ni
UK Gold coin	-	Ag, Cu, Zn and Ni

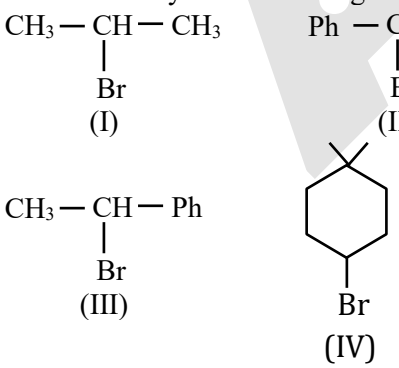
7. Which of the following complex has d^4 configuration?

(1) $[Fe(CN)_6]^{3-}$ (2) $[MnF_6]^{3-}$
(3) $[Co(CN)_6]^{3-}$ (4) $[CoCl_4]^{3-}$

Ans. **(2)**

Sol. (1) $[Fe(CN)_6]^{3-}$
Fe^{+3} : $3d^5$
(2) $[MnF_6]^{3-}$
Mn^{+3} : $3d^4$
(3) $[Co(CN)_6]^{3-}$
Co^{+3} : $3d^6$
(4) $[CoCl_4]^{2-}$
Co^{+2} : $3d^7$

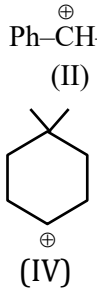
8. Rate of solvolysis in following compound is



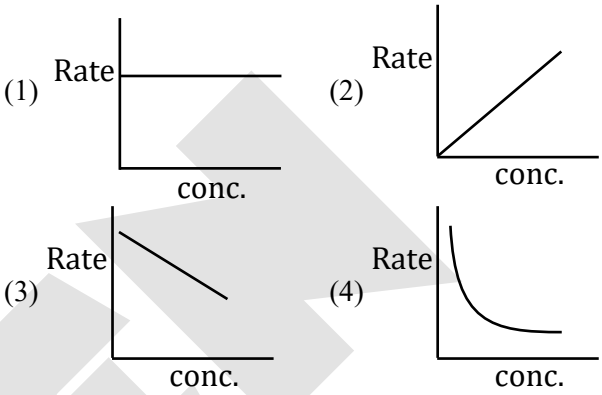
(1) II > IV > III > I (2) III > II > I > IV
(3) II > III > IV > I (4) II > III > I > IV

Ans. **(4)**

Sol. Rate of solvolysis α stability of carbocation.
Order of stability



9. Which one of the following plot represents zero order reaction.



Ans. **(1)**

Sol. For zero order reaction
Rate = K $[C]^0$
Rate = K → constant

10. By using relation
$\Delta G = \Delta H - T\Delta S$
Which of the following is incorrect for spontaneous reaction at a given temperature
(1) $\Delta H > 0, \Delta S > 0$ (2) $\Delta H > 0, \Delta S < 0$
(3) $\Delta H < 0, \Delta S > 0$ (4) $\Delta H < 0, \Delta S < 0$

Ans. **(2)**

Sol. (1) $\Delta H > 0, \Delta S > 0 \rightarrow$ Spontaneous at high temperature
(2) $\Delta H > 0, \Delta S < 0 \rightarrow$ Non-Spontaneous always
(3) $\Delta H < 0, \Delta S > 0 \rightarrow$ Spontaneous at all temperature
(4) $\Delta H < 0, \Delta S < 0 \rightarrow$ Spontaneous at Low temperature

11. The plots of $\frac{1}{x_A}$ vs $\frac{1}{y_A}$ (where, x_A and y_A are the mole fraction of liquid A in liquid and vapour phase respectively) is linear with slope and intercepts respectively.

(1) P_A^0/P_B^0 and $\frac{(P_A^0 - P_B^0)}{P_B^0}$
(2) P_A^0/P_B^0 and $\frac{(P_B^0 - P_A^0)}{P_B^0}$
(3) P_B^0/P_A^0 and $\frac{(P_A^0 - P_B^0)}{P_A^0}$
(4) P_B^0/P_A^0 and $\frac{(P_B^0 - P_A^0)}{P_B^0}$

Ans. **(3)**

Sol $$y_A = \frac{x_A P_A^0}{x_A P_A^0 + (1-x_A).P_B^0}$$

$$\frac{1}{y_A} = \frac{x_A\left(P_A^0 - P_B^0\right)}{x_A P_A^0} + \frac{P_B^0}{x_A P_A^0}$$

$$\frac{1}{y_A} = \frac{\left(P_A^0 - P_B^0\right)}{P_A^0} + \frac{P_B^0}{P_A^0}.\frac{1}{x_A}$$

12. Vapour pressure decrease by 10 mm of Hg. When mole fraction of non-volatile solute is 0.2. What is the mole fraction of solvent if vapour pressure decreases by 20 mm of Hg.

(1) 0.3 (2) 0.4

(3) 0.5 (4) 0.6

Ans. **(4)**

Sol. $$\frac{P_0 - P_s}{P_0} = X_{solute}$$

$$\frac{10}{20} = \frac{0.2}{X_{solute}}$$

$X_{solute} = 0.4$

$X_{solvent} = 0.6$

13. Given standard reduction potential of the following electrodes

$E^o_{Mg^{2+}/Mg} = -2.36$ V $\quad E^o_{Ag^+/Ag} = 0.8$ V

$E^o_{Zn^{2+}/Zn} = -0.76$ V $\quad E^o_{Cu^{2+}/Cu} = 0.34$ V

Which of the following Galvanic cell has reaction with most –ve $\Delta G°$

(1) $Zn(s)|Zn^{2+}(aq) \,||\, Ag^+(aq) \,|\, Ag(s)$

(2) $Cu(s)|Cu^{2+}(aq) \,||\, Ag^+(aq) \,|\, Ag(s)$

(3) $Zn(s)|Zn^{2+}(aq) \,||\, Cu^{2+}(aq) \,|\, Cu(s)$

(4) $Cu(s)|Cu^{2+}(aq) \,||\, Mg^{2+}(aq) \,|\, Mg(s)$

Ans. **(1)**

Sol. Cell reaction

$Zn + 2Ag^+ \longrightarrow Zn^{2+} + 2Ag$

$E^\circ_{cell} = 0.76 + 0.80 = 1.56$ V

$\Delta G° = -n F E^\circ_{cell}$ $\quad E^\circ_{cell} \rightarrow$ is maximum

there fore $\Delta G°$ is most –ve

14. 0.01 mole of an organic compound (Hydrocarbon) gives 1.76 gm CO_2 and 0.9 gm H_2O on complete combustion. Find out chemical formula of compound.

(1) C_3H_8 (2) C_4H_{10}

(3) C_3H_{12} (4) C_6H_{14}

Ans. **(2)**

Sol. $$C_xH_y + x + \left(x + \frac{y}{4}\right) O_2 \rightarrow xCO_2 + \frac{y}{2} H_2O$$

0.01 mole

$$0.01\ x = \frac{1.76}{44}$$

$$x = \frac{1.76}{44} = 4$$

$$0.01\ \frac{y}{2} = \frac{0.9}{18}$$

$$y = 2 \times \frac{90}{18} = 10$$

15. 3 M of NaCl whose density is 1.25 g/ml. Find its Molality.

(1) 3.86 mol/Kg (2) 2.79 mol/Kg

(3) 1.97 mol/Kg (4) 0.786 mol/Kg

Ans. **(2)**

Sol. $$m = \frac{M \times 1000}{1000d - M \times (Mw)_{solute}}$$

$$m = \frac{3000}{1250 - 3 \times 58.5}$$

$m = 2.79$ mol/Kg

16. Consider the given following reaction

$X_2Y(g) \rightleftharpoons X_2(g) + \frac{1}{2} Y_2(g)$. If a is the degree of dissociation. Calculate K_p in terms of P total pressure. (assume : $\alpha << 1$)

(1) $K_P = \frac{\alpha^{3/2} P^{1/2}}{\sqrt{2}}$

(2) $K_P = \frac{\alpha^{1/2} P^{1/2}}{\sqrt{3}}$

(3) $K_P = \frac{\alpha P^{1/2}}{\sqrt{2}}$

(4) $K_P = \frac{\alpha^{1/2} P^{5/2}}{\sqrt{2}}$

Ans. **(4)**

Sol. $X_2Y(g) \rightleftharpoons X_2(g) + \frac{1}{2} Y_2(g)$

1 -

$1-\alpha \approx 1$ $\quad \alpha$ $\quad \frac{\alpha}{2}$

$$n_{total} = 1 + \frac{\alpha}{2} \approx 1$$

$$K_P = \frac{\frac{\alpha \times P}{1}\left(\frac{\alpha}{2} \times P\right)^{1/2}}{1 \times P}$$

$$K_P = \frac{\alpha^{(3/2)} P^{(1/2)}}{\sqrt{2}}$$

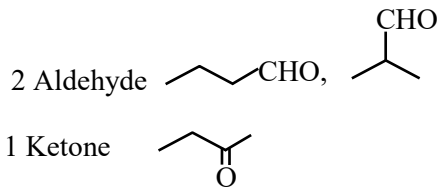
17. The total number of isomers possible (aldehyde & ketones) for C_4H_8O are:

(1) 3 (2) 4

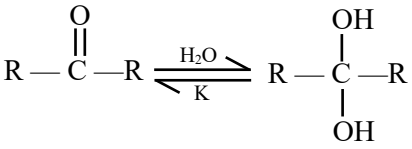
(3) 5 (4) 6

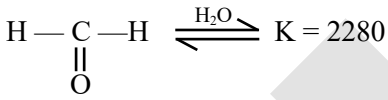
Ans. **(1)**

Sol. Total isomers are 3

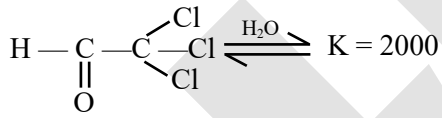


18. Consider the following



Statement I: 

because side groups are small.

Statement II: 

due to – I effect of Cl atom.

(1) Statement I and Statement II both 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 are incorrect.

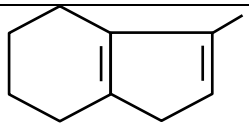
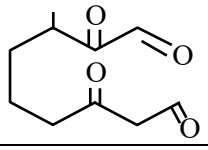
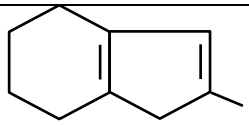
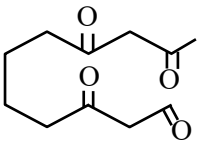
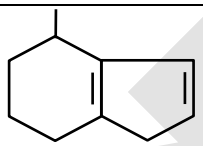
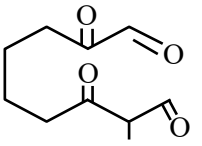
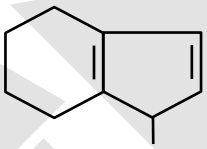
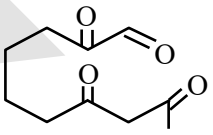
Ans. **(1)**

Sol. $K_{eq.}$ = 2280 is for HCHO

$K_{eq.}$ = 2000 is for Chloral (CCl_3CHO)

Both data is given in Clayden and Warren book.

19. Match the following with reactant and product in presence of O_3/Zn, H_2O

Reactant		Product	
(A)		(P)	
(B)		(Q)	
(C)		(R)	
(D)		(S)	

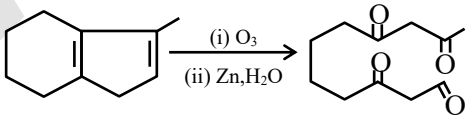
(1) A-Q, B-S, C-P, D-R

(2) A-Q, B-S, C-R, D-P

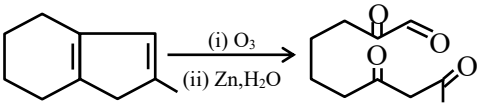
(3) A-S, B-Q, C-P, D-R

(4) A-Q, B-P, C-S, D-R

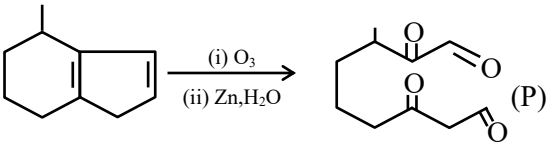
Ans. **(1)**

Sol. (A) 

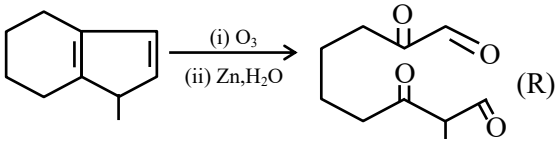
(Q)

(B) 

(S)

(C) 

(P)

(D) 

(R)

SECTION-B

20. 0.01 mole of an organic compound (containing 10% by mass of Hydrogen) on complete combustion gives 0.9 gm of H_2O. If molecular mass of organic compound is x. Value of x is

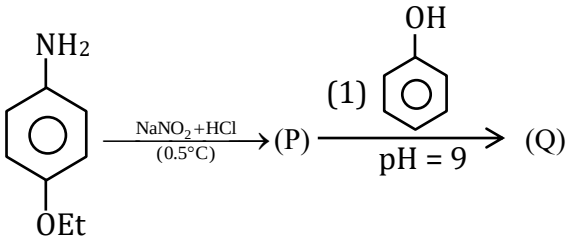
Ans. **(100)**

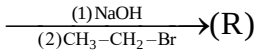
Sol applying POAC on Hydrogen atom

$$0.01 \times x \times 0.1 = \frac{0.9}{18} \times 2$$

$$x = \frac{18}{18} \times 100 = 100 \text{ g/mole}$$

21.

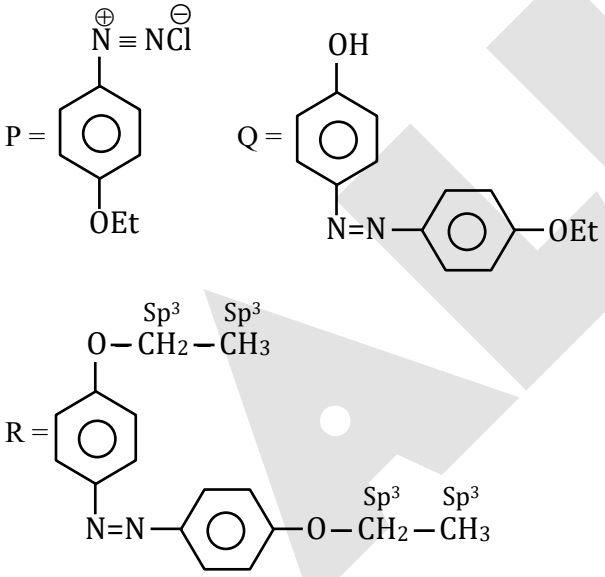




The number of sp^3 hybridized carbon atom in (R) is:

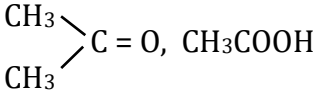
Ans. **(4)**

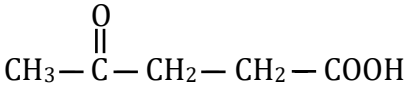
Sol.



Total sp^3 carbon in product R is 4.

22. A compound X consume two moles of H_2 and when 'X' heated with $KMnO_4/H^+$ gives

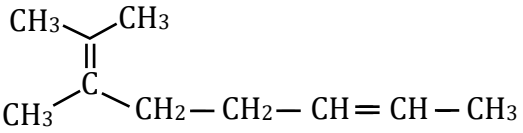




Number of s bonds in X are _____.

Ans. **(27)**

Sol. Structure of X is :



It has 27 σ-bonds.

23. Number of linear compounds ?

I_3^- ,NO_2, O_3, OF_2, NO_2^+, $BeCl_2$, N_3^-, SO_3, CO_2, XeF_2

Ans. **(6)**

Sol.

I_3^- → Linear
NO_2 → Bent
O_3 → Bent
OF_2 → Bent
NO_2^+ → Linear
$BeCl_2$ → Linear
N_3^- → Linear
SO_3 → Trigonal Planar
CO_2 → Linear
XeF_2 → Linear

24. Find the change in entropy when 1 kg of ice goes from –5°C to 110°C.

Given that:

Specific heat of ice = 2 kJ kg^{-1} K^{-1}

Specific heat of liquid water = 4.2 kJ K^{-1} kg^{-1}

Specific heat of water vapour = 2.0 kJ kg^{-1} K^{-1} ;

Latent heat of fusion of ice = 344 kJ kg^{-1}

Latent heat of vapourisation of water = 249 kJ kg^{-1}

[Take : $\ell n268 = 5.59$, $\ell n273 = 5.6$, $\ln 373 = 5.9$, $\ln 383 = 5.95$]

Give your answer as nearest integer.

Ans. **(3)**

Sol. $\underset{-5°C}{H_2O_{(S)}} \rightarrow \underset{0°C}{H_2O_{(S)}} \rightarrow \underset{0°C}{H_2O_{(\ell)}} \rightarrow \underset{100°C}{H_2O_{(\ell)}} \rightarrow \underset{100°C}{H_2O_{(g)}} \rightarrow \underset{110°C}{H_2O_{(g)}}$

$$\Delta S = 2\ell n\frac{273}{268} + \frac{344}{273} + 4.2\ell n\frac{373}{273} + \frac{249}{373} + 2\ell n\frac{383}{373}$$

$\Delta S = 3.3 \text{ d} \simeq 3$

25. 81 gm of Al reacts with 128 gm of O_2. Calculate the amount of Al_2O_3 is produced?

Ans. **(153)**

Sol. $\rightarrow 2A\ell + \frac{3}{2}O_2 \longrightarrow Al_2O_3$

$\rightarrow \frac{81}{27} \quad \frac{128}{32}$

= 3 mole 4 mole

(LR)

If 2 moles of $A\ell$ gives 1 mole of $A\ell_2O_3$ then 3 mole of $A\ell$ gives 1.5 mole of $A\ell_2O_3$.

1.5 mole of $A\ell_2O_3$ = 153 gm