

TEST PAPER OF JEE(MAIN) EXAMINATION – 2019

(Held On Saturday 12th JANUARY, 2019) TIME : 02 : 30 PM To 05 : 30 PM

CHEMISTRY

1. 8g of NaOH is dissolved in 18g of H₂O. Mole fraction of NaOH in solution and molality (in mol kg⁻¹) of the solutions respectively are :

- (1) 0.167, 11.11 (2) 0.2, 22.20
 (3) 0.2, 11.11 (4) 0.167, 22.20

Ans. (1)

Sol. 8g NaOH, mol of NaOH = $\frac{8}{40} = 0.2 \text{ mol}$

18g H₂O, mol of H₂O = $\frac{18}{18} = 1 \text{ mol}$

$$\therefore X_{\text{NaOH}} = \frac{0.2}{1.2} = 0.167$$

$$\text{Molality} = \frac{0.2 \times 1000}{18} = 11.11 \text{ m}$$

2. The correct statement(s) among I to III with respect to potassium ions that are abundant within the cell fluids is/are :

- I. They activate many enzymes
 II. They participate in the oxidation of glucose to produce ATP
 III. Along with sodium ions, they are responsible for the transmission of nerve signals

- (1) I, II and III (2) I and III only
 (3) III only (4) I and II only

Ans. (1)

Sol. All the three statements are correct a/c to NCERT (s-block)

3. The magnetic moment of an octahedral homoleptic Mn(II) complex is 5.9 BM. The suitable ligand for this complex is :

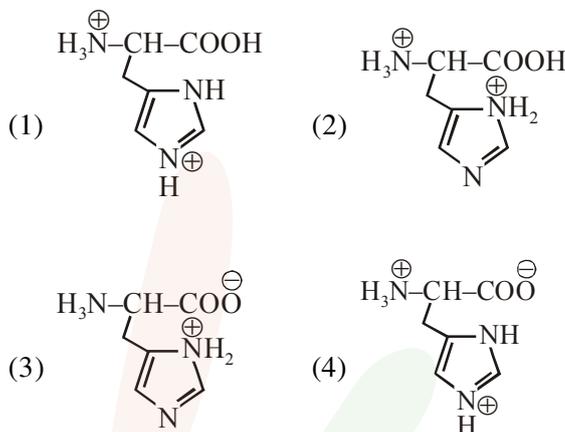
- (1) CN⁻ (2) NCS⁻
 (3) CO (4) ethylenediamine

Ans. (2)

Sol. $\mu = 5.9 \text{ BM} \therefore n$ (no of unpaired.e⁻) = 5
 Cation Mn^{II} – 3d⁵ confn only possible for relatively weak ligand.

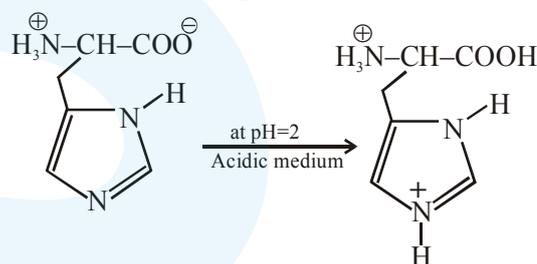
\therefore NCS⁻

4. The correct structure of histidine in a strongly acidic solution (pH=2) is



Ans. (1)

Sol. Histidine is



Zwitter ionic form

$$pI_n = 7.59$$

5. The compound that is NOT a common component of photochemical smog is :

- (1) O₃ (2) CH₂=CHCHO
 (3) CF₂Cl₂ (4) H₃C-C(=O)-OONO₂

Ans. (3)

Sol. Freons (CFC's) are not common components of photo chemical smog.

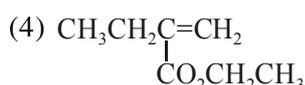
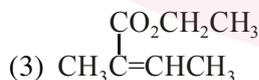
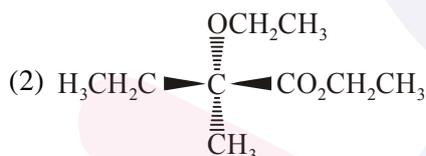
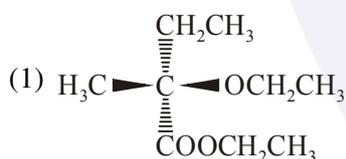
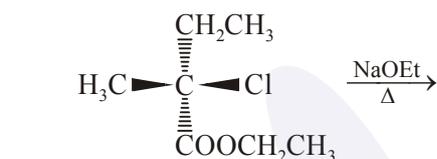
6. The upper stratosphere consisting of the ozone layer protects us from the sun's radiation that falls in the wavelength region of :

- (1) 600-750 nm
- (2) 0.8-1.5 nm
- (3) 400-550 nm
- (4) 200-315 nm

Ans. (4)

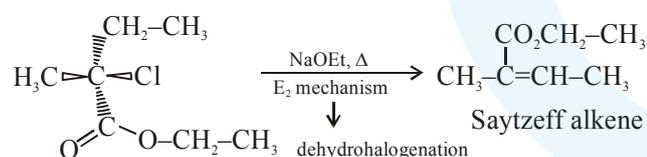
Sol. Ozone protects most of the medium frequencies ultraviolet light from 200 - 315 nm wave length.

7. The major product of the following reaction is:

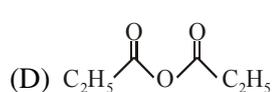
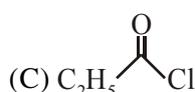
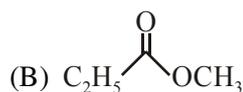
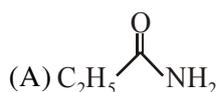


Ans. (3)

Sol.



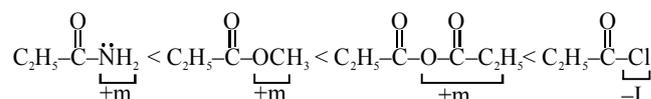
8. The increasing order of the reactivity of the following with LiAlH_4 is :



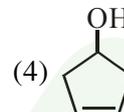
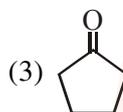
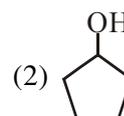
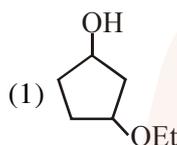
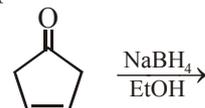
- (1) (A) < (B) < (D) < (C)
- (2) (A) < (B) < (C) < (D)
- (3) (B) < (A) < (D) < (C)
- (4) (B) < (A) < (C) < (D)

Ans. (1)

Sol. Rate of nucleophilic attack on carbonyl \propto Electrophilicity of carbonyl group



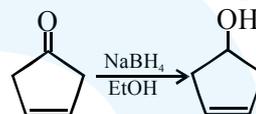
9. The major product of the following reaction is:



Ans. (4)

Sol. NaBH_4 can not reduce $\text{C}=\text{C}$

but can reduce -C(=O)- into OH .



10. Molecules of benzoic acid ($\text{C}_6\text{H}_5\text{COOH}$) dimerise in benzene. 'w' g of the acid dissolved in 30 g of benzene shows a depression in freezing point equal to 2K. If the percentage association of the acid to form dimer in the solution is 80, then w is :

(Given that $K_f = 5 \text{ K kg mol}^{-1}$, Molar mass of benzoic acid = 122 g mol^{-1})

- (1) 1.8 g
- (2) 2.4 g
- (3) 1.0 g
- (4) 1.5 g

Ans. (2)

Sol. $2(\text{C}_6\text{H}_5\text{COOH}) \xrightarrow[\text{dimer}]{\text{C}_6\text{H}_6, (30\text{g})} (\text{C}_6\text{H}_5\text{COOH})_2$

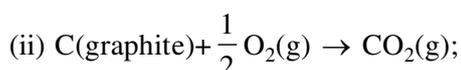
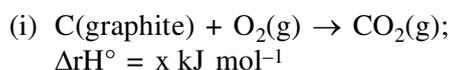
$$\Delta_f T = i k_f m$$

$$2 = 0.6 \times 5 \times \frac{w \times 1000}{122 \times 30}$$

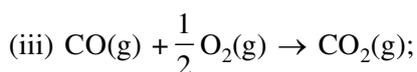
$$(i = 1 - 0.8 + 0.4 = 0.6)$$

$$w = 2.44 \text{ g}$$

11. Given :



$$\Delta_r H^\circ = y \text{ kJ mol}^{-1}$$



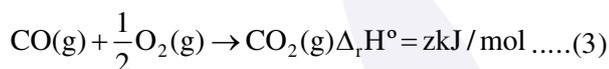
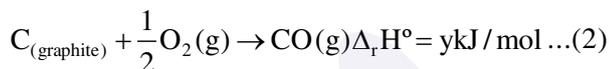
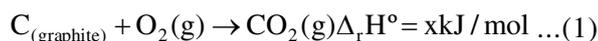
$$\Delta_r H^\circ = z \text{ kJ mol}^{-1}$$

Based on the above thermochemical equations, find out which one of the following algebraic relationships is correct ?

- (1) $z = x + y$ (2) $x = y - z$
 (3) $x = y + z$ (4) $y = 2z - x$

Ans. (3)

Sol.



$$(1) = (2) + (3)$$

$$x = y + z$$

12. An open vessel at 27°C is heated until two fifth of the air (assumed as an ideal gas) in it has escaped from the vessel. Assuming that the volume of the vessel remains constant, the temperature at which the vessel has been heated is :

- (1) 750°C (2) 500°C
 (3) 750 K (4) 500 K

Ans. (4)

Sol. $\frac{2}{5}$ air escaped from vessel, $\therefore \frac{3}{5}$ air remain in vessel. P, V constant

$$n_1 T_1 = n_2 T_2$$

$$n_1(300) = \left(\frac{3}{5} n_1\right) T_2 \Rightarrow T_2 = 500 \text{ K}$$

13. Λ_m° for NaCl, HCl and NaA are 126.4, 425.9 and 100.5 S cm²mol⁻¹, respectively. If the conductivity of 0.001 M HA is 5 × 10⁻⁵ S cm⁻¹, degree of dissociation of HA is :

- (1) 0.75 (2) 0.125 (3) 0.25 (4) 0.50

Ans. (2)

Sol.

$$\Lambda_m^\circ(\text{HA}) = \Lambda_m^\circ(\text{HCl}) + \Lambda_m^\circ(\text{NaA}) - \Lambda_m^\circ(\text{NaCl})$$

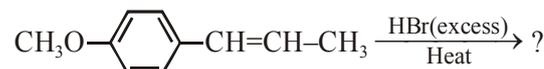
$$= 425.9 + 100.5 - 126.4$$

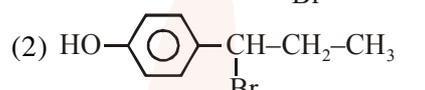
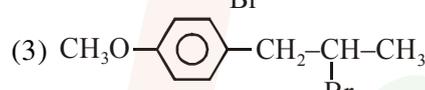
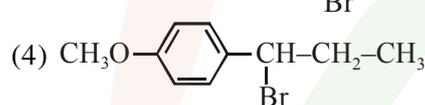
$$= 400 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\Lambda_m = \frac{1000K}{M} = \frac{1000 \times 5 \times 10^{-5}}{10^{-3}} = 50 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\alpha = \frac{\Lambda_m}{\Lambda_m^\circ} = \frac{50}{400} = 0.125$$

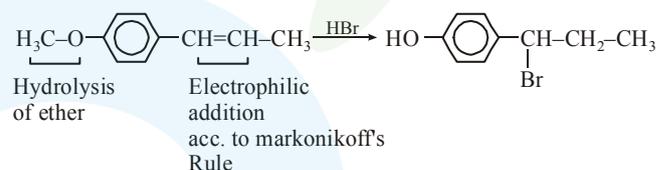
14. The major product in the following conversion is :



- (1) 
 (2) 
 (3) 
 (4) 

Ans. (2)

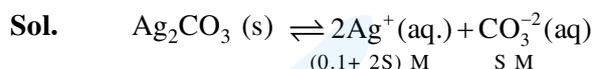
Sol.



15. If K_{sp} of Ag_2CO_3 is 8×10^{-12} , the molar solubility of Ag_2CO_3 in 0.1M AgNO_3 is :

- (1) $8 \times 10^{-12} \text{ M}$ (2) $8 \times 10^{-10} \text{ M}$
 (3) $8 \times 10^{-11} \text{ M}$ (4) $8 \times 10^{-13} \text{ M}$

Ans. (2)



$$K_{sp} = [\text{Ag}^+]^2[\text{CO}_3^{2-}]$$

$$8 \times 10^{-12} = (0.1 + 2S)^2 (S)$$

$$S = 8 \times 10^{-10} \text{ M}$$

16. Among the following, the false statement is :

- (1) Latex is a colloidal solution of rubber particles which are positively charged
- (2) Tyndall effect can be used to distinguish between a colloidal solution and a true solution.
- (3) It is possible to cause artificial rain by throwing electrified sand carrying charge opposite to the one on clouds from an aeroplane.
- (4) Lyophilic sol can be coagulated by adding an electrolyte.

Ans. (1)

Sol. Colloidal solution of rubber are negatively charged.

17. The pair that does NOT require calcination is:

- (1) ZnO and MgO
- (2) Fe₂O₃ and CaCO₃.MgCO₃
- (3) ZnO and Fe₂O₃.xH₂O
- (4) ZnCO₃ and CaO

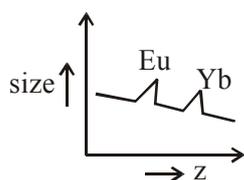
Ans. (1)

Sol. ZnO & MgO both are in oxide form therefore no change on calcination.

18. The correct order of atomic radii is :

- (1) Ce > Eu > Ho > N
- (2) N > Ce > Eu > Ho
- (3) Eu > Ce > Ho > N
- (4) Ho > N > Eu > Ce

Ans. (3)



Sol.

Eu > Ce > Ho > N.

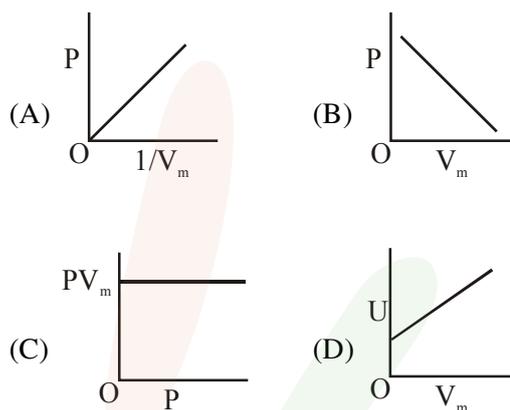
19. The element that does NOT show catenation is:

- (1) Sn
- (2) Ge
- (3) Si
- (4) Pb

Ans. (4)

Sol. Catenation is not shown by lead.

20. The combination of plots which does not represent isothermal expansion of an ideal gas is:

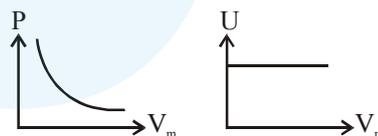


- (1) (A) and (C)
- (2) (A) and (D)
- (3) (B) and (D)
- (4) (B) and (C)

Ans. (3)

Sol. Isothermal expansion $PV_m = K$ (Graph-C)

$$P = \frac{K}{V_m} \text{ (Graph-A)}$$



21. The volume strength of 1M H₂O₂ is:

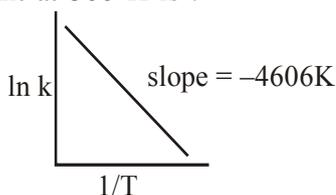
(Molar mass of H₂O₂ = 34 g mol⁻¹)

- (1) 16.8
- (2) 11.35
- (3) 22.4
- (4) 5.6

Ans. (2)

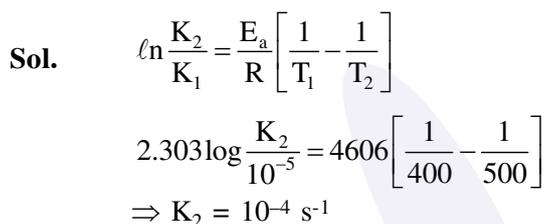
Sol. 1L – 1M H₂O₂ solution will produce 11.35 L O₂ gas at STP.

22. For a reaction consider the plot of $\ln k$ versus $1/T$ given in the figure. If the rate constant of this reaction at 400 K is 10^{-5} s^{-1} , then the rate constant at 500 K is :



- (1) $2 \times 10^{-4} \text{ s}^{-1}$ (2) 10^{-4} s^{-1}
 (3) 10^{-6} s^{-1} (4) $4 \times 10^{-4} \text{ s}^{-1}$

Ans. (2)

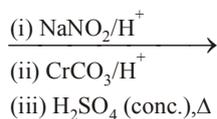
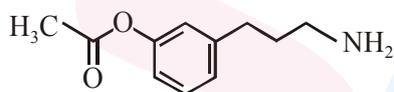


23. The element that shows greater ability to form $p\pi-p\pi$ multiple bonds, is :
 (1) Si (2) Ge (3) Sn (4) C

Ans. (4)

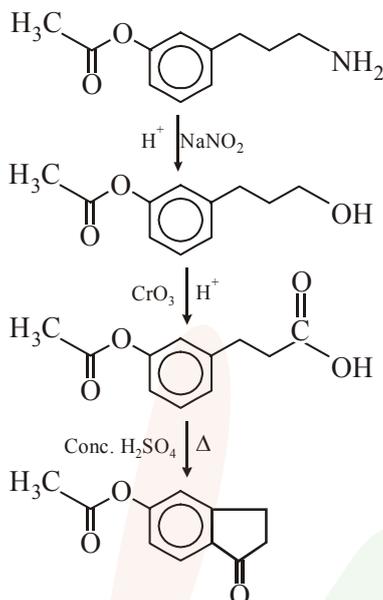
Sol. carbon atom have 2p orbitals able to form strongest $p\pi - p\pi$ bonds

24. The major product of the following reaction is:



- (1)
- (2)
- (3)
- (4)

Ans. (2)



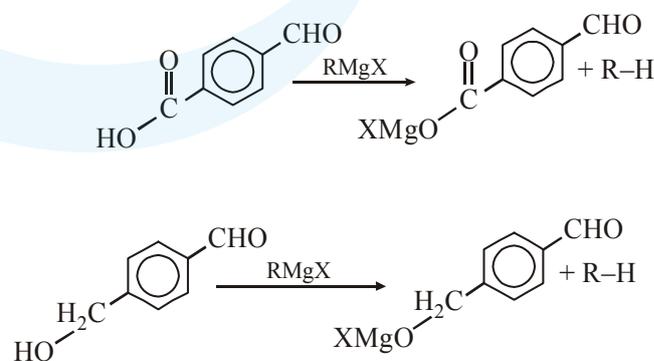
Sol.

25. The aldehydes which will not form Grignard product with one equivalent Grignard reagents are :

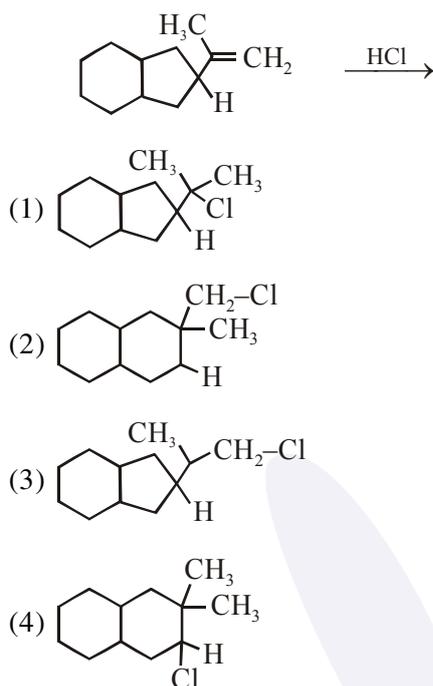
- (A)
- (B)
- (C)
- (D)
- (1) (B), (C), (D) (2) (B), (D)
 (3) (B), (C) (4) (C), (D)

Ans. (2)

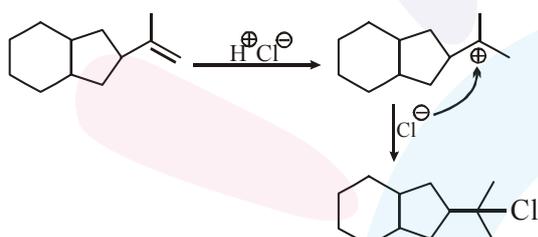
Sol. Acid-base reaction of G.R are fast.



26. The major product of the following reaction is:



Ans. (1)

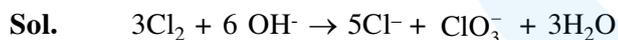


Sol.

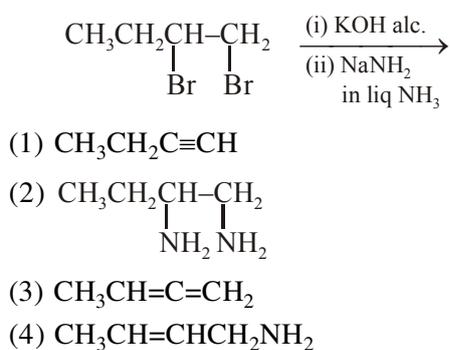
27. Chlorine on reaction with hot and concentrated sodium hydroxide gives :

- (1) Cl^- and ClO_2^- (2) Cl^- and ClO_3^-
 (3) Cl^- and ClO^- (4) ClO_3^- and ClO_2^-

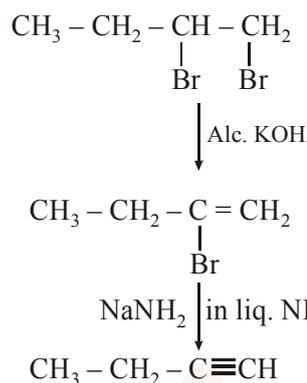
Ans. (2)



28. The major product of the following reaction is:



Ans. (1)



Sol.

29. If the de Broglie wavelength of the electron in n^{th} Bohr orbit in a hydrogenic atom is equal to $1.5\pi a_0$ (a_0 is Bohr radius), then the value of n/z is :

- (1) 1.0 (2) 0.75 (3) 0.40 (4) 1.50

Ans. (2)

Sol. According to de-broglie's hypothesis

$$2\pi r_n = n\lambda \Rightarrow 2\pi \cdot a_0 = \frac{n^2}{z} = n \times 1.5\pi a_0$$

$$\frac{n}{z} = 0.75$$

30. The two monomers for the synthesis of Nylon 6, 6 are :

- (1) $\text{HOOC}(\text{CH}_2)_6\text{COOH}$, $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$
 (2) $\text{HOOC}(\text{CH}_2)_4\text{COOH}$, $\text{H}_2\text{N}(\text{CH}_2)_4\text{NH}_2$
 (3) $\text{HOOC}(\text{CH}_2)_6\text{COOH}$, $\text{H}_2\text{N}(\text{CH}_2)_4\text{NH}_2$
 (4) $\text{HOOC}(\text{CH}_2)_4\text{COOH}$, $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$

Ans. (4)

Sol. Nylon-6,6 is polymer of

Hexamethylene diamine & Adipic acid

