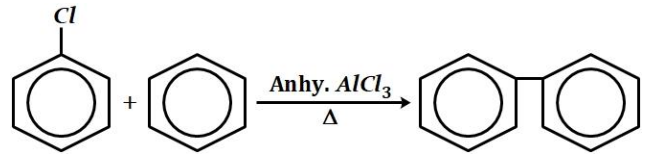
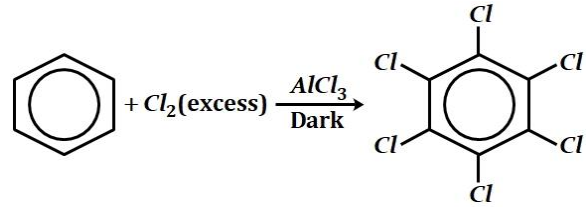
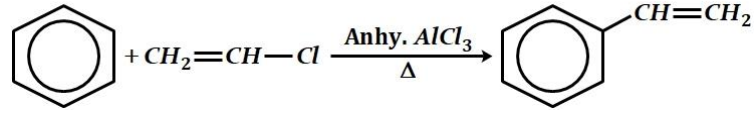
JEE Mains 2020

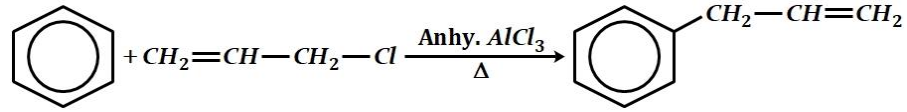
7th Jan Shift 2 Paper – Chemistry

1. Which of the following reactions are possible?

I. 

II. 

III. 

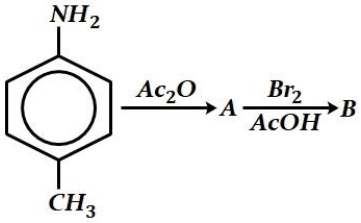
IV. 

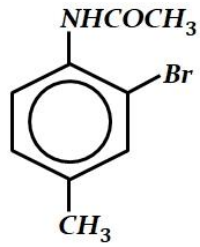
A) I, II, III B) II, IV C) I, III, IV D) I, III

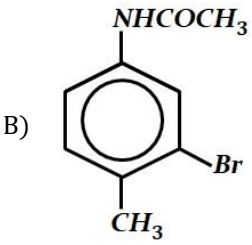
Ans. B

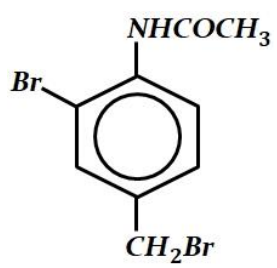
Sol. Vinyl halides and aryl halides do not give Friedel's craft's reaction.

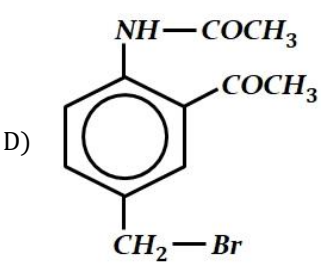
2. *A* and *B* are in the given reaction?



A) 

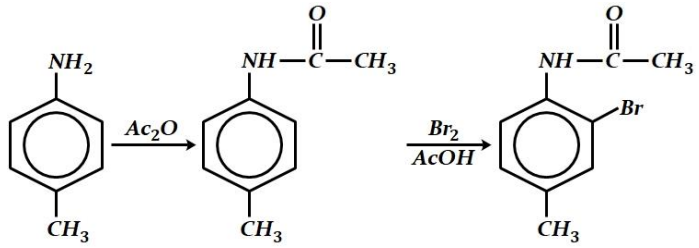
B) 

B) 

D) 

Ans. A

Sol.



3. The correct statement about gluconic acid is

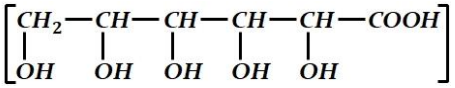
A) It is prepared by oxidation of glucose with HNO_3

B) It is obtained by partial oxidation of glucose

C) It is dicarboxylic acid

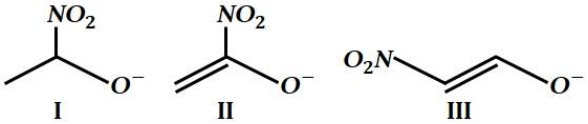
D) It forms hemiactal or acetal

Ans. B

Sol. Gluconic acid  is obtained by partial oxidation of glucose by Tollen's reagent Fehling solution or Br_2, H_2O.

Gluconic acid can not form hemiacetal or acetal

4. Stability order of following alkoxide ions is



A) III > II > I B) I > III > II C) II > I > III D) III > I > II

Ans. A

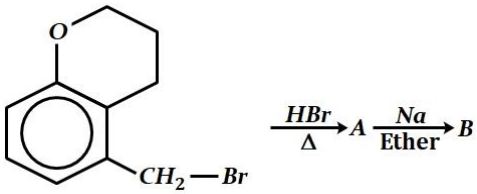
Sol. When negative charge is delocalized with electron withdrawing group like (NO_2) then stability increases.

A) Negative charge is delocalized with NO_2 group

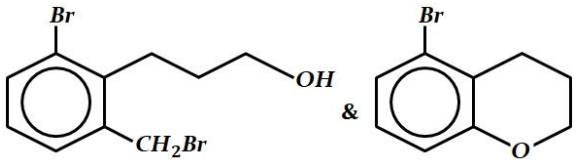
B) Negative charge is delocalized with carbon of alkene

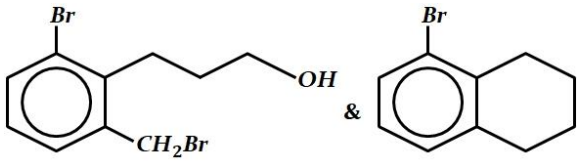
C) Negative charge is localized

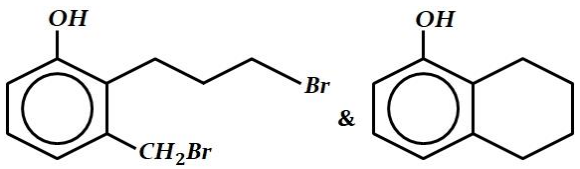
5.

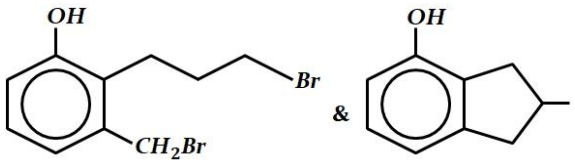


A and *B* are -

A) 

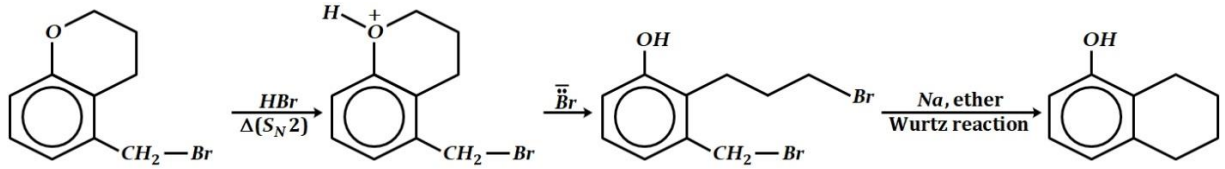
B) 

C) 

D) 

Ans. A

Sol.



6. For the complex $[Ma_2b_2]$ if M is sp^3 or dsp^2 hybridised respectively then total number of optical isomers are respectively:

A) 1, 1 B) 2, 1 C) 0, 0 D) 1, 2

Ans. C

Sol. Both will not show optical isomerism.

7. Both order and magnetic nature of CN^- are respectively

A) 3, diamagnetic
B) 3, paramagnetic
C) 2.5, paramagnetic
D) 2.5, diamagnetic

Ans. A

Sol. CN^- is a 14 electron system.

8. Which of the following is incorrect?

A) $\Lambda_m^\circ\ NaCl - \Lambda_m^\circ\ NaBr = \Lambda_m^\circ\ KCl - \Lambda_m^\circ\ KBr$
B) $\Lambda_m^\circ\ H_2O = \Lambda_m^\circ\ HCl + \Lambda_m^\circ\ NaOH - \Lambda_m^\circ\ NaCl$
C) $\Lambda_m^\circ\ NaI - \Lambda_m^\circ\ NaBr = \Lambda_m^\circ\ NaBr - \Lambda_m^\circ\ KBr$
D) $\Lambda_m^\circ\ NaCl - \Lambda_m^\circ\ KCl - \Lambda_m^\circ\ NaBr - \Lambda_m^\circ\ KBr$

Ans. C

Sol. Theory based.

9. $\underset{\text{Hot \& conc.}}{NaOH} + Cl_2 \rightarrow A +$ other products

$\underset{\text{Cold \& dil..}}{Ca(OH)_2} + Cl_2 \rightarrow B +$ other products

A & B are respectively

A) $NaClO_3, Ca(OCl)_2$
B) $NaClO_3, Ca(ClO_3)_2$
C) $NaCl, Ca(ClO_3)_2$
D) $NaClO, Ca(ClO_3)_2$

Ans. A

Sol. $6NaOH + 3Cl_2 \rightarrow 5NaCl + NaClO_3 + 3H_2O$

$2Ca(OH)_2 + Cl_2 \rightarrow Ca(OCl)_2 + CaCl_2 + H_2O$

10. There are two beakers (I) having pure volatile solvent and (II) having volatile solvent and non-volatile solute. If both beakers are placed together in a closed container then:

A) Volume of solvent beaker will decrease and solution beaker will increase
B) Volume of solvent beaker will increase and solution beaker will also increase
C) Volume of solvent beaker will decrease and solution beaker will also decrease
D) Volume of solvent beaker will increase and solution beaker will decrease

Ans. A

Sol. There will be lowering in vapour pressure in second beaker.

11. Metal with low melting point containing impurities of high melting point can be purified by

A) None refining
B) Vapor phase refining
C) Distillation
D) Liquation

Ans. D

Sol. Theory based.

12. Which of the following statements are correct?

I. On decomposition of H_2O_2, O_2 gas is released.
II. 2-ethylanthraquinol is used in preparation of H_2O_2
III. On heating $KClO_3, Pb(NO_3)_2, NaNO_3$, O_2 gas is released.
IV. In the preparation of sodium peroxoborate, H_2O_2 is treated with sodium metaborate.

A) I, II, IV B) II, III, IV C) I, II, III, IV D) I, II, III

Ans. C

Sol. Theory based.

13. Among the following which is redox reaction?

A) $N_2 + O_2 \xrightarrow{2000\ K}$

B) Formation of O_3 from O_2

C) Reaction between $NaOH$ and H_2SO_4

D) Reaction between $AgNO_3$ and $NaCl$

Ans. A

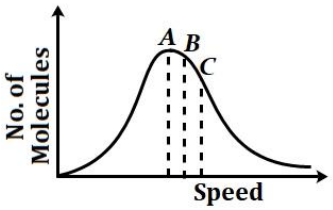
Sol. $N_2 + O_2 \rightarrow 2NO$

$3O_2 \rightarrow 2O_3$

$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

$AgNO_3 + NaCl \rightarrow NaNO_3 + AgCl$

14.



Select the correct options:

A) $A = C_{MPS}, B = C_{\text{Average}}, C = C_{RMS}$

B) $A = C_{\text{Average}}, B = C_{MPS}, C = C_{RMS}$

C) $A = C_{RMS}, B = C_{\text{Average}}, C = C_{MPS}$

D) $A = C_{\text{Average}}, B = C_{MPS}, C = C_{RMS}$

Ans. A

Sol. $C_{RMS} > C_{\text{Average}} > C_{MPS}$

15. Which one of the following amongs each pair will release maximum energy on gaining one electron $(A = F, Cl), (B = S, Se), (C = Li, Na)$

A) $(A) = Cl, (B) = S, (C) = Li$

B) $(A) = S, (B) = Cl, (C) = Li$

C) $(A) = Li, (B) = Cl, (C) = S$

D) $(A) = Cl, (B) = Li, (C) = S$

Ans. A

Sol. Theory based

16. Which of the following statements are incorrect?

I. Co^{+3} with strong field ligand forms high magnetic moment complex.

II. For Co^{+3} if pairing energy $(P) > \Delta_0$ then the complex formed will have t_{2g}^4, e_g^2 configuration

III. For $[Co(en)_3]^{3+} \lambda_{\text{absorbed}}$ is less than $\lambda_{\text{absorbed}}$ for $[CoF_6]^{3-}$

IV. If $\Delta_0 = 18000\ cm^{-1}$ for Co^{+3} then with same ligands for it $\Delta t = 16000\ cm^{-1}$

A) I, IV

B) II, III

C) I, II

D) I, II, III, IV

Ans. A

Sol. Theory based

17. 0.6 g of urea on strong heating with $NaOH$ evolves NH_3. Liberated NH_3 will combine completely with which of the following HCl solution?

A) 100 mL of 0.2 N HCl

B) 400 mL of 0.2 N HCl

C) 100 mL of 0.1 N HCl

D) 200 mL of 0.2 N HCl

Ans. A

Sol. $2 \times$ moles of Urea $\equiv$ mole of NH_3 (1)

mole of NH_3 = mole of HCl (2)

$\therefore$ mole of $HCl = 0.02$ mole

18. Wait

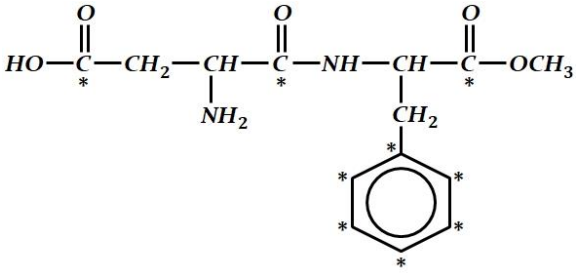
19. Wait

20. Wait

21. Number of sp^2 hybrid carbon atoms in aspartame is –

Ans. 9

Sol.



All stared carbon atoms of aspartame are sp^2 hybrid. Aspartame is methyl ester of dipeptide formed from aspartic acid and phenylalanine.

22. 3 $gram$ of acetic acid is mixed in 250 mL of 0.1 M HCl. This mixture is now diluted to 500 mL. 20 mL of this solution is now taken is another container $\frac{1}{2}mL$ of 5M $NaOH$ is added to this. Find the pH of this solution. Find the pH of this solution. ($\log 3 = 0.4771, pK_a = 4.74$)

Ans. 5.22

Sol. m $mole$ of acidic acid in 20 $mL = 2$

m $mole$ of HCl in 20 $mL = 1$

m $mole$ of $NaOH = 2.5$

$CH_3COOH + NaOH$ (remaining) $\rightarrow CH_3COONa +$ water

2	3/2	0	0
0.5	0	3/2	–

$$pH = pK_a + \log\frac{3/2}{2}$$

$$= 4.74 + \log 3$$

$$= 4.74 + 0.48 = 5.22$$

23. Flocculation value for As_2S_3 sol by HCl is 30 m $mole$ L^{-1}. Calculate mass of H_2SO_4 required in gram for 250 mL sol.

Ans. 00.37

Sol. For 1 L sol 30 m mol of HCl is required

$\therefore$ For 1 L sol 15 m mol H_2SO_4 is required

For 250 mL of sol

$$\frac{15}{4} \times 10^{-3} m \text{ mol } H_2SO_4 \equiv 0.3675\ g$$

24. $NaCl \xrightarrow[\text{Conc. } H_2SO_4]{K_2Cr_2O_7(s)} (A) \xrightarrow{NaOH} (B) \xrightarrow[+H_2O_2]{\text{dil. } H_2SO_4} (C)$

Determine total number of atoms in per unit formula of (A), (B) & (C)

Ans. 18.00

Sol. $(A) = CrO_2Cl_2$

$(B) = Na_2CrO_4$

$(C) = CrO_5$

25. Calculate $\Delta_f H°$(in kJ/mol) for $C_2H_6(g)$, if $\Delta_c H°\left[C_{(\text{graphite})}\right] = -393.5\ \frac{kJ}{mol}$,

$\Delta_c H°[H_2(g)] = -286\ kJ/mol$ and

$\Delta_c H°[C_6H_6(g)] = -1560\ kJ/mol$

Ans. -85.00

Sol. $C_6H_2(g) + 3.5O_2(g) \rightarrow 2Co_2(g) + 3H_2O(l)$

$2 \times (-393.5) + 3 \times (-286) - (-1560) = -85\ kJ/mol$