JEE(ADVANCED)-2013 PAPER 2

CHEMISTRY

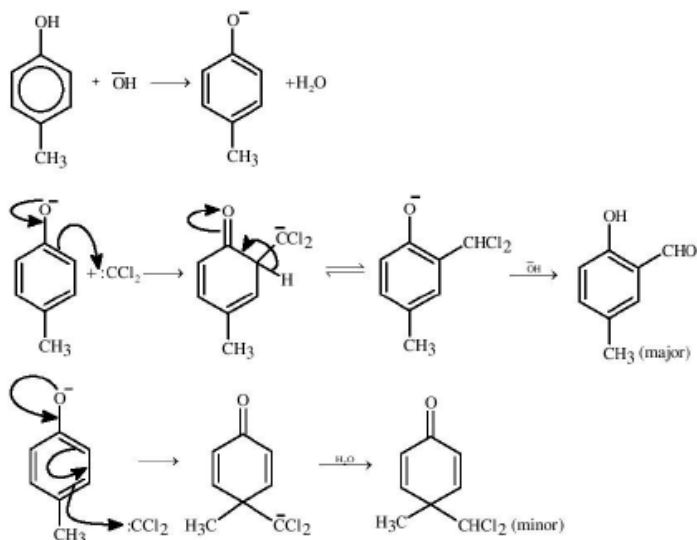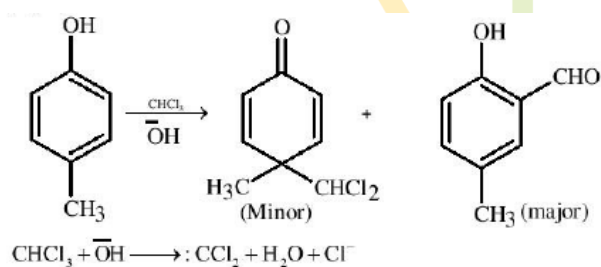**21. Sol**: (B)

$$K_{sp} = 1.1 \times 10^{-12} = \left[Ag^+ \right]^2 \left[CrO_4^{-2} \right]$$
$$1.1 \times 10^{-12} = \left[0.1 \right]^2 \left[s \right]$$
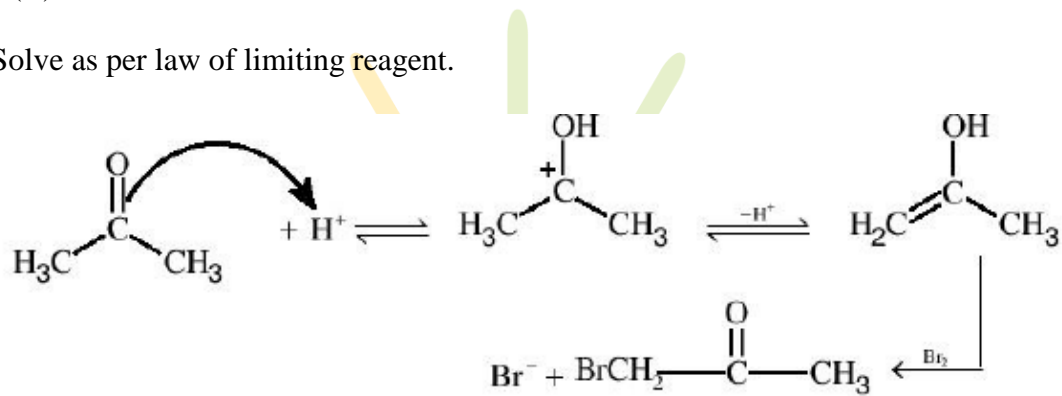$$s = 1.1 \times 10^{-10}$$

22. Sol: (B, D)

23. Sol: (B)
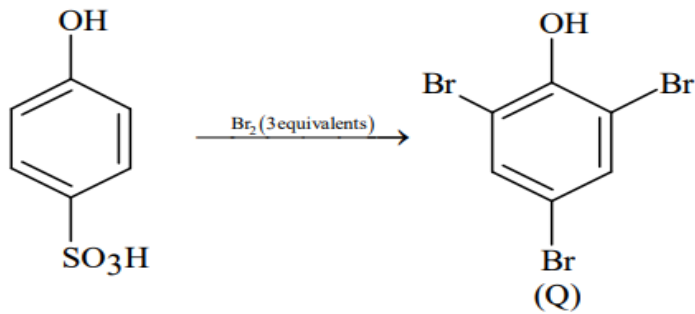
24. Sol: (C)

Solve as per law of limiting reagent.

25. Sol: (A, C, D)

26. Sol: (A, B)

$$_{4}^{9}\text{Be} + \gamma \rightarrow {_{4}^{8}\text{Be}} + {_{0}^{1}\text{n}}$$
$$_{4}^{9}\text{Be} + {_{1}^{1}P} \rightarrow {_{4}^{8}\text{Be}} + {_{1}^{2}H}$$
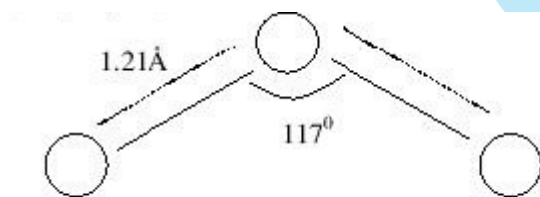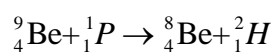
Hence (A) and (B) are correct

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27. Sol: (C, D)

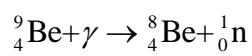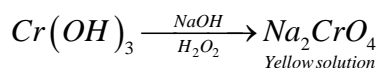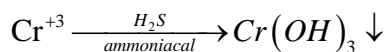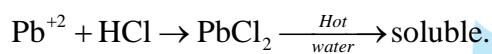Fe_2O_3 and SnO_2 undergoes C reduction. Hence (C) and (D) are correct.

28. Sol: (A, B, D)

For the equilibrium $CaCo_3(s) \rightleftharpoons CaO(s) + CO_2(g)$. The equilibrium constant (K) is independent of initial amount of $CaCO_3$ where as at a given temperature is independent of pressure of CO_2. ΔH is independent of catalyst and it depends on temperature. Hence $(A), (B)$ and (D) are correct.

29. Sol: A

30. Sol: (D)

Solution for the Q. No. 29 to 30.

$$Pb^{+2} + HCl \rightarrow PbCl_2 \xrightarrow[water]{Hot} soluble.$$
$$Cr^{+3} \xrightarrow[ammoniacal]{H_2S} Cr(OH)_3 \downarrow$$
$$Cr(OH)_3 \xrightarrow[H_2O_2]{NaOH} \underset{Yellow\,solution}{Na_2CrO_4}$$
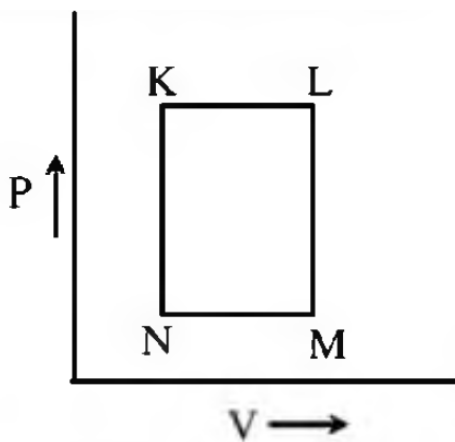
31. Sol: (B)
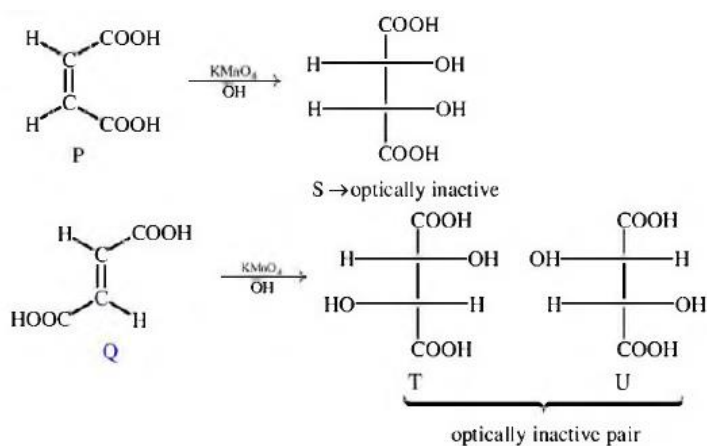
32. Sol: (A)
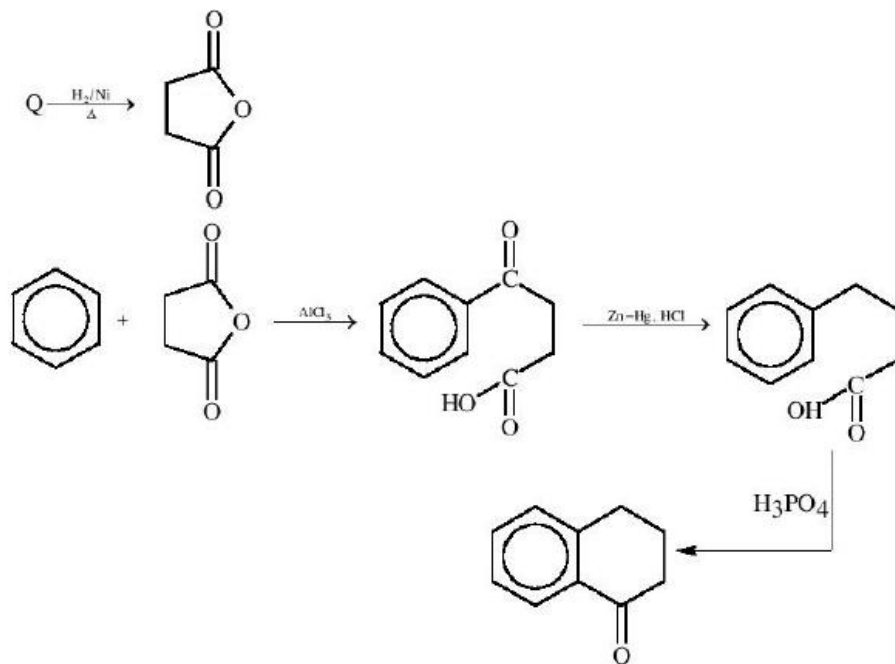
33. Sol: (C)

34. Sol: (B)

Solution for the Q. No. 33 to 34.
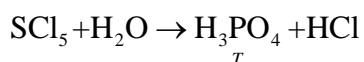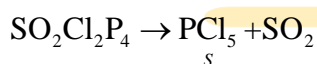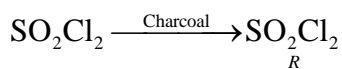

$K - L$ heating, isobaric

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$L-M$ cooling, isochoric

$M-N$ cooling, isobaric

$N-K$ heating, isochoric

35. Sol: (A)

36. Sol: (A)

Solution for the Q. No. 35 to 36

$$2NaOH + Cl_2 \rightarrow NaCl + \underset{P}{NaClO} + H_2O$$
(Cold+dil)

$$6NaOH + 3Cl_2 \rightarrow 5NaCl + \underset{Q}{NaClO_3} + 3H_2O$$
(Hot+conc.)

$$SO_2Cl_2 \xrightarrow{Charcoal} \underset{R}{SO_2Cl_2}$$

$$SO_2Cl_2P_4 \rightarrow \underset{S}{PCl_5} + SO_2$$

$$SCl_5 + H_2O \rightarrow \underset{T}{H_3PO_4} + HCl$$

37. Sol: (D)

(P) $PbO_2 + H_2SO_4 \xrightarrow{\Delta} PbSO_4 + H_2O + \dfrac{1}{2}O_2$

(Q) $2Na_2S_2O_3 + Cl_2 + 2H_2O \rightarrow 2NaCl + 2NaHSO_4 + 2S$

(R) $N_2H_4 + 2I_2 \rightarrow N_2 + 4HI$

(S) $XeF_2 + 2NO \rightarrow Xe + 2NOF$

38. Sol. (A)

(P)

(Q)

(R)

(S)

39. Sol. (A)

(P) $\underset{X}{(C_2H_5)_3\,N} + \underset{Y}{CH_3COOH} \rightarrow (C_2H_5)_3\,NH^+CH_3COO^-$
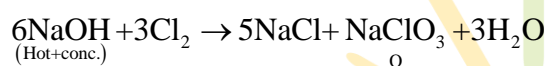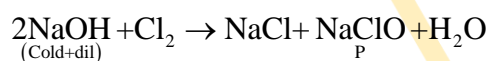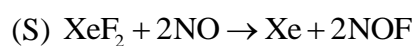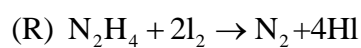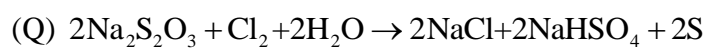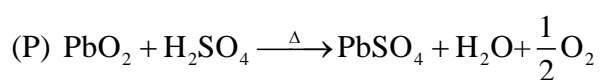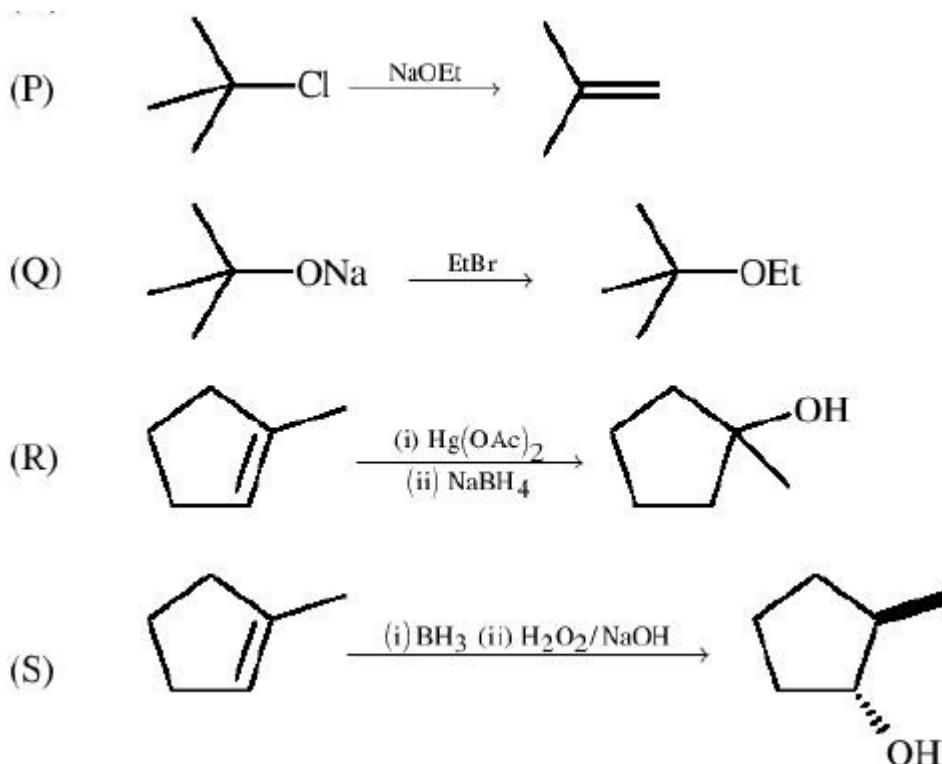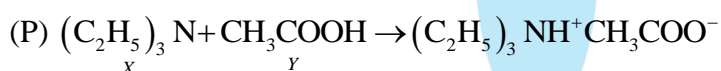
Initially conductivity increases due to ion formation after that it becomes practically constant because X alone can not form ions. Hence (3) is the correct match.

(Q) $\underset{X}{KI(0.1M)} + \underset{Y}{AgNO_3(0.01M)} \rightarrow AgI \downarrow + KNO_3$
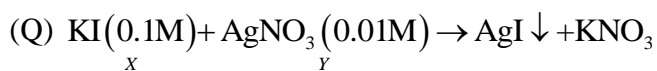
Number of ions in the solution remains constant until all the $AgNO_3$ precipitated as AgI. Thereafter conductance increases due to increases in number of ions. Hence (4) is the correct match.

(R) Initially conductance decreases due to the decrease in the number of $\overline{OH}$ ions thereafter it slowly increases due to the increases in number of H^+ ions. Hence (2) is the correct match.

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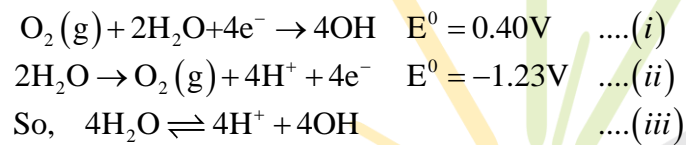(S) Initially it decreases due to decrease in H^+ ions and then increases due to the increases in $\overline{OH}$ ions. Hence (1) is the correct match.

40. Sol. (D)

(P)

$$\Delta G^0_{Fe^{3+}/Fe} = \Delta G^0_{Fe^{3+}/Fe^{2+}} + \Delta G^0_{Fe^{2+}/Fe}$$

$$\Rightarrow -3 \times FE^0_{(Fe^{+3}/Fe)} = -1 \times FE^0_{(Fe^{+3}/Fe)} + \left(-2 \times FE^0_{Fe^{+2}/Fe}\right)$$

$$\Rightarrow E^0_{Fe^{+3}/Fe} = 0.04V$$

(Q)

$$O_2(g) + 2H_2O + 4e^- \rightarrow 4OH \quad E^0 = 0.40V \quad ....(i)$$
$$2H_2O \rightarrow O_2(g) + 4H^+ + 4e^- \quad E^0 = -1.23V \quad ....(ii)$$
$$So, \quad 4H_2O \rightleftharpoons 4H^+ + 4OH \quad ....(iii)$$

$$E^0 \text{ for } III^{rd} \text{ reduction} = 0.40 - 1.23 = -0.83V$$

(R)

$$\Delta G^0_{Cu^{2+}/Cu} = \Delta G^0_{(Cu^{2+}/Cu^+)} + \Delta G^0_{(Cu^+/Cu)}$$

$$-2 \times FE^0_{Cu^{2+}/Cu} = -1 \times FE^0_{Cu^{2+}/Cu^+} + \left(-1 \times FE^0_{Cu^+/Cu}\right)$$

$$\Rightarrow E^0_{Cu^{2+}/Cu} = -0.18V$$

(S)

$$\Delta G^0_{Cr^{+3}/Cr^{+2}} = \Delta G^0_{Cr^{+3}/Cr} + \Delta G^0_{Cr/Cr^{+2}}$$

$$-1 \times F \times E^0_{Cr^{+3}/Cr^{+2}} = -3 \times F \times E^0_{Cr^{+3}/Cr} + \left(-2 \times F \times E^0_{Cr/Cr^{+2}}\right)$$

$$\Rightarrow E^0_{Cr^{+3}/Cr^{+2}} = -0.4V$$