JEE Advanced 2014 Paper-2

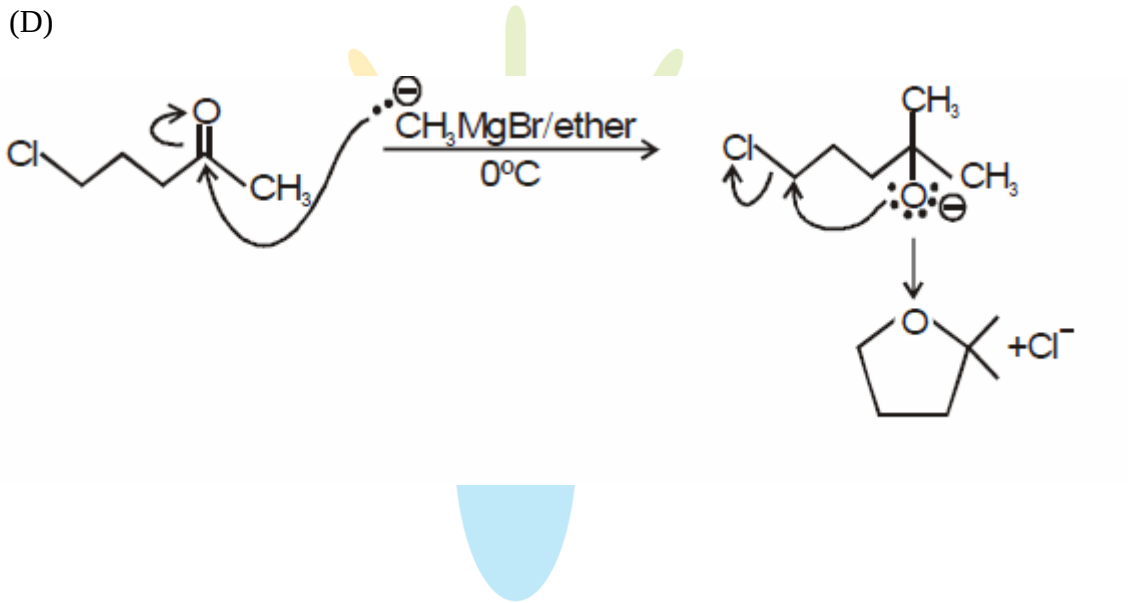
Chemistry

Sol. 21: **(**A)

The reaction goes as follows:

$$P_4(s)+8SOCl_2(t)\rightarrow 4PCl_3(l)+4SO_2(g)+2S_2Cl_2(g)$$

Sol. 22: (D)



Sol. 23: (A)

The reactions are as follows:

$$H_2O_2+KIO_4\rightarrow KIO_3+O_2+H_2O$$

$$40NH_2OH+10H_2O_2\rightarrow 7H_2O+20N_2O_3$$

Thus, it acts as: Reducing Agent in the first reaction and Oxidising Agent in the second reaction.

Sol. 24: (D)

The first reaction goes as follows:

$$XeF_6 + 3H_2O \rightarrow XeO_6 + 6HF$$

This is followed by the following reaction:

$$XeO_3 + HO^- \rightarrow \underset{\text{hydrogenxenate ion}}{HXeO_4^-}$$

This ion when followed by further reaction gives:

$$2HXeO_4^- + 2OH^- \rightarrow XeO_4^{6-} + Xe + O_2 + 2H_2O$$

Thus, three gases including water, xenon and oxygen are produced.

Sol. 25: (C)

$$Ph_3C-CO \xrightarrow[H_2O]{H^3} Ph_3C-OH + ROH$$

The reaction proceeds by S_N1 Mechanism:

$$Ph_3C\text{–}OR + H^{\oplus} \rightleftharpoons Ph_3C\overset{\oplus}{O}HR \rightleftharpoons Ph_3C^{\oplus} + ROH$$

$$\uparrow\downarrow H_2O$$

$$Ph_3C\text{–}OH \xleftarrow{-H^{\oplus}} Ph_3C\text{–}\overset{\oplus}{O}H_2$$

Greater the electron releasing effect of the attached groups greater is the stability of intermediate carbocation, & faster is the rate of reaction.

If two $Ph-$ groups are replaced by two *para*-methoxyphenyl groups, strong $+M$ effect of $MeO-$ groups stabilize, the carbocation better there by making the reaction faster.

Sol. 26: (B)

This is due to the fact that branching of the chain makes the molecule more compact and thereby decreases the surface area. Therefore, the intermolecular attractive forces which depend upon the surface area, also become small in magnitude on account of branching. Consequently, *the boiling points of the branched chain alkanes are less than the straight chain isomers.*

Sol. 27: (B)

β −Naphthol or 2 -Naphthol is identified by using a due test using an acidic solution.

Sol. 28: (B)

B_2 exists in the gas phase as a paramagnetic radical.

Sol. 29: (B)

Let the rate of reaction be given by:

$r \propto [M]^n$

Let the initial concentration and rate be given by: x, r_1

Then the final concentration and rate would be given by: $2x, r_2$

So we get:

$$\frac{r_2}{r_1} = \frac{(2x)^n}{(x)^n} = (2)^n$$

But, we know that:

$$\frac{r_2}{r_1} = 8$$

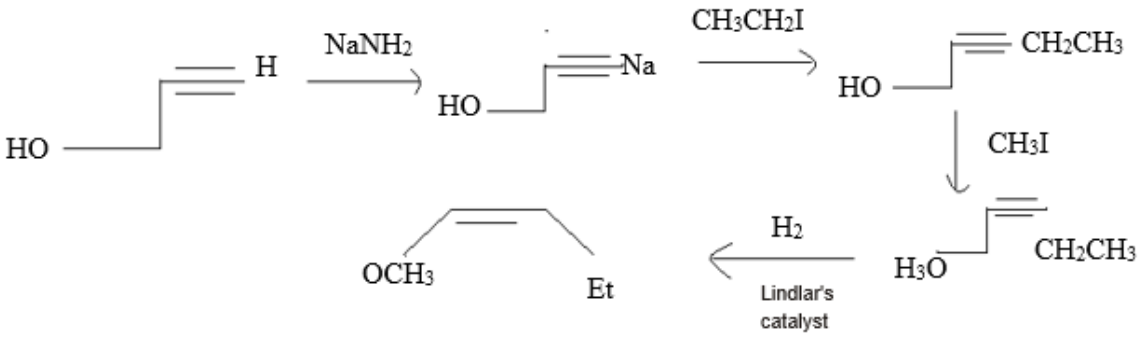
So, we get: $n = 3$.

Sol. 30: (B)

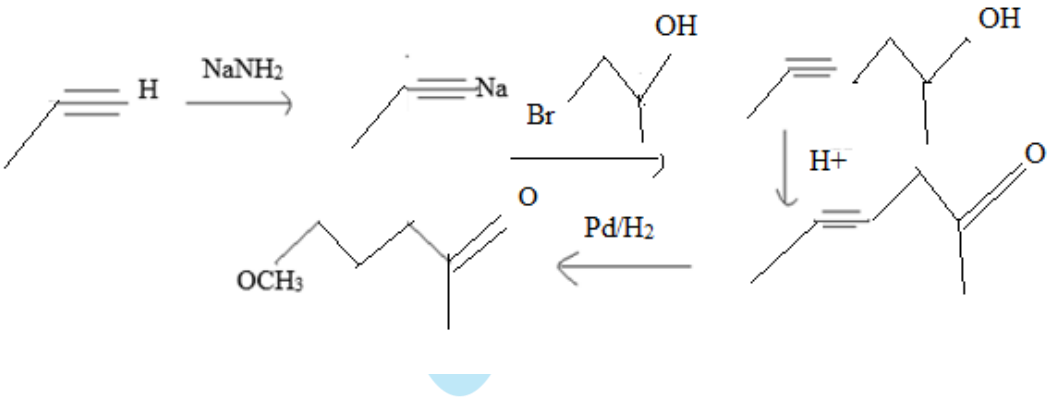
As the reaction is an endothermic reaction, this results into a decrease in entropy of the surroundings and since a orderly arrangement of liquid changes to gas, the entropy of the system increases.

Sol. 31: **(**A)

The reaction goes as follows:



Sol. 32:(A)



Sol. 33: (B)

We know that $NiCl_4^{2-}$ is tetrahedral and $NiCl_4^{2-}$ is square planar.

Thus, it satisfies the given relation and thus the choice is B.

Sol. 34: (B)

Na_2HPO_4 forms white salts the precipitate of which dissolves in excess.

Sol. 35: (C)

$$\frac{r_x}{r_y} = \sqrt{\frac{M_x}{M_y}} = \sqrt{\frac{40}{10}} = \frac{2}{1}$$

Now since the rate of diffusion is proportional to distance covered, so we have:

$$\frac{d}{24-d} = \frac{2}{1}$$

Hence, we have:

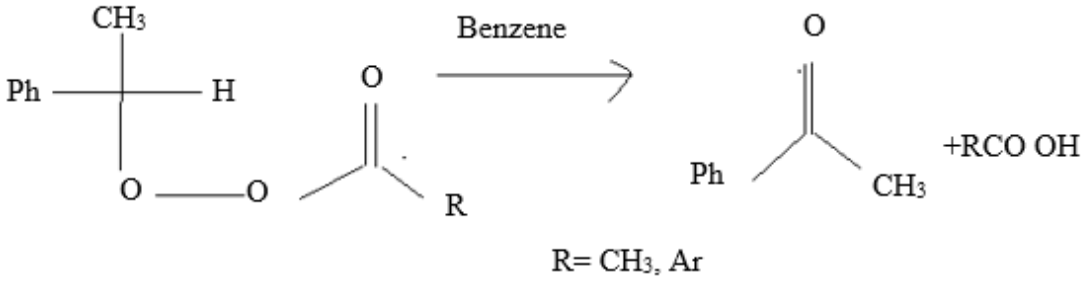
$$3d = 24 \times 2 \Rightarrow d = 16$$

Sol. 36: (B)

The reason being the molecular mass would influence the mean free path of the gas.

Sol. 37: (B)

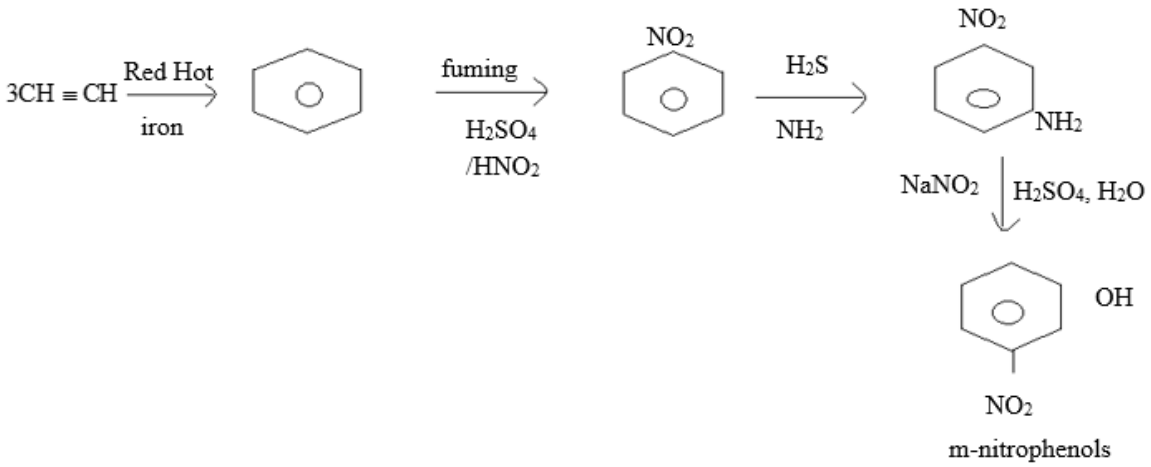
The reaction is as follows:



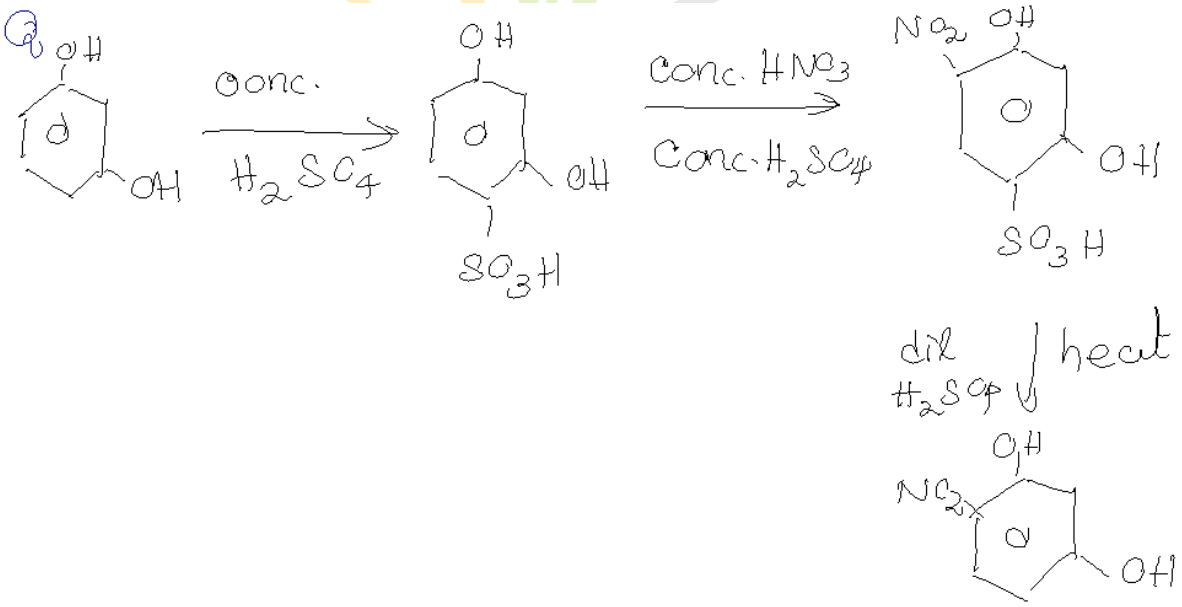
R= CH_3, Ar

Sol. 38: (C)

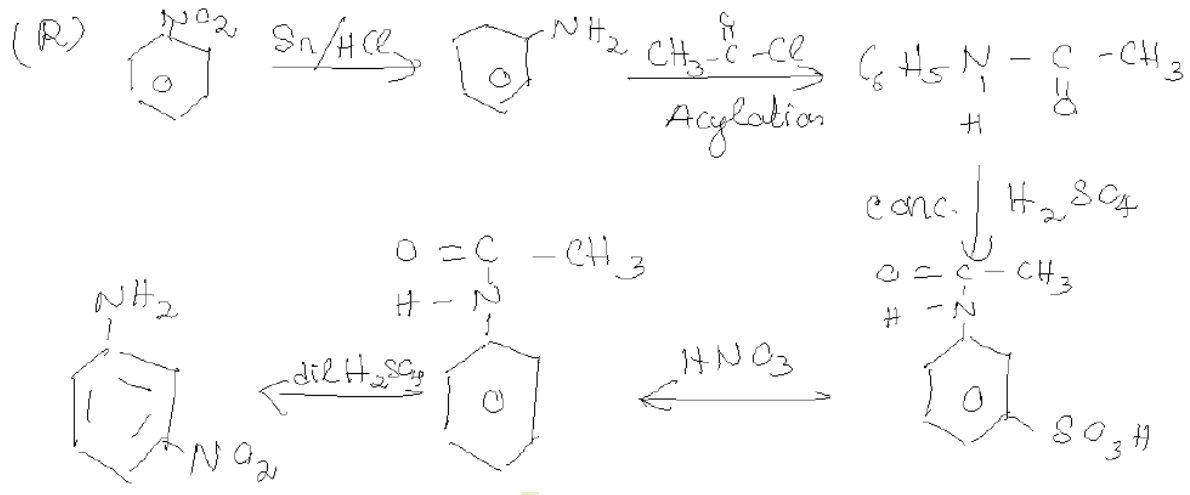
(P)


3CH ≡ CH
Red Hot
iron
fuming
H2SO4
/HNO2
NO2
H2S
NH2
NO2
NH2
NaNO2
H2SO4, H2O
OH
NO2
m-nitrophenols

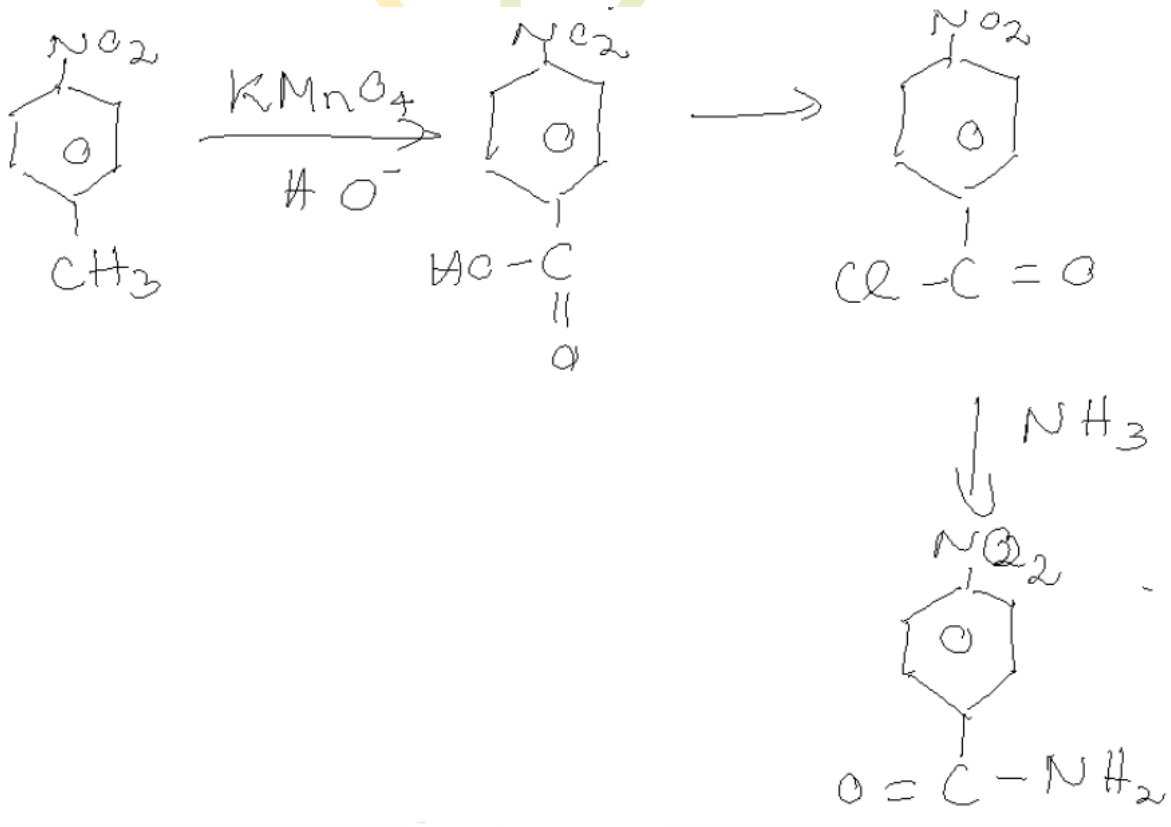
(Q)


OH
Conc.
H2SO4
OH
SO3H
Conc. HNO3
Conc. H2SO4
NO2
OH
OH
SO3H
dil
H2SO4
heat
OH
NO2
OH

(R)



(S)



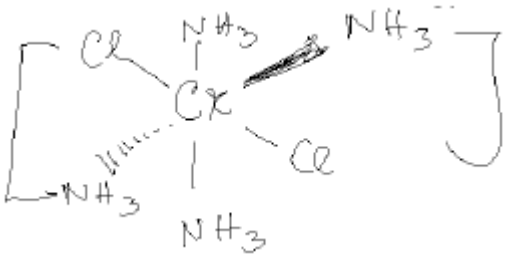
Sol. 39: (B)

We have P as: $\left[\mathrm{Cr}\left(\mathrm{NH}_3\right)_4 \mathrm{Cl}_2\right]\mathrm{Cl}$.

Now the central atom shows an oxidation number of $+3$.

Therefore, it shows paramagnetic behaviours and therefore exhibits cis-trans isomerism.

The structure is given by:



For Q, we have:

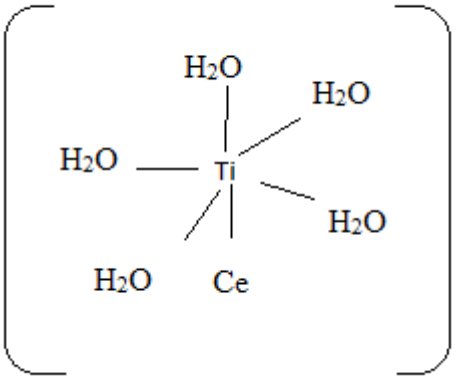
Q

$\left[\mathrm{Ti}\left(\mathrm{H_2O}\right)_5\mathrm{Ce}\right]\left(\mathrm{NO_3}\right)_2$

$\Rightarrow x-1=2 \quad \mathrm{Ti(III)}$

$\Rightarrow x-3$

But $\mathrm{H_2O}$ and $\mathrm{Cl_2}$ are weak ligands $\therefore$ Paramagnetic



$\mathrm{Q} \rightarrow 1$

For R we have:

$\mathrm{R} \rightarrow 4$

$\left[\mathrm{Pt(en)(NH_3)(e)NO_3}\right]$

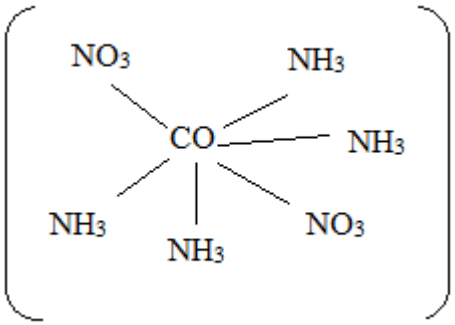
As (en) *and* (NH_3) are strong, so it is going to shoe diamagnetism and exhibits ionisation is isomerism

For S we have

$S \rightarrow 2$

$\left[Co(NH_3)_4(NO_3)\right]NO_3$

Diamagnetic and exhibits cis-trans isomerism



Sol. 40: (C)

 ⟶ It is d–d axial overlap in same phase, so d–dσ bonding.

 ⟶ It is p & d lateral overlap in same phase, so it is p–dπ bonding.

 ⟶ It is p and d lateral overlap in opposite phase, so it is p–dπ antibonding.

 ⟶ It is d–d axial overlap in opposite phase, so it is d–d σ antibonding.