JEE MAIN ANSWER KEY & SOLUTIONS

SUBJECT :- CHEMISTRY

CLASS :- 12th **PAPER CODE :- CWT-6**

CHAPTER :- COORDINATION COMPOUND

ANSWER KEY

1.	(C)	**2.**	(A)	**3.**	(A)	**4.**	(C)	**5.**	(D)	**6.**	(C)	**7.**	(B)
8.	(C)	**9.**	(B)	**10.**	(A)	**11.**	(B)	**12.**	(B)	**13.**	(A)	**14.**	(D)
15.	(B)	**16.**	(C)	**17.**	(C)	**18.**	(B)	**19.**	(D)	**20.**	(C)	**21.**	1
22.	6	**23.**	3	**24.**	3	**25.**	9	**26.**	4	**27.**	4	**28.**	4
29.	1	**30.**	3										

SOLUTIONS

1. (C)

Sol. In a coordination complex the central metal atom/ion acts as lewis acid while ligands act as lewis bases. Therefore

$Co^{3+} \rightarrow$ lewis acid

$NH_3 \rightarrow$ lewis base

2. (A)

Sol. Double salts are generally made up of two or more salts, when disolve in water breaks into individual ions, by lossing their identity.

3. (A)

Sol. NH_4^+ cannot be a ligand because it does not contain lone pair of electron.

4. (C)

Sol. Chloro bis (ethylenediammine) nitrocobalt (III) chloride

5. (D)

Sol. Tris (ethylenediamine) cobalt (III) sulphate $[Co(en)_3]_2(SO_4)_3$

6. (C)

Sol. 1mole of this compound produces = 3 mole ions.

It is $[Co(NH_3)_5NO_2]Cl_2 \rightarrow [Co(NH_3)_5NO_2]^+ + 2Cl^-$

7. (B)

Sol. EAN = 25 – 0 + 2 × 5

25 + 10 = 35

doesn't exist as monomer.

8. (C)

Sol. Exception : square planar & paramagnetic.

9. (B)

Sol. Complex with CN^- ligands are usually low spin complexes.

10. (A)

Sol. According to spectrochemical series

11. (B)

Sol. t_{2g} orbital in octahedral crystal field lowered by 0.4 Δ_0 from barycentre.

12. (B)

Sol. Higher the value of K_f (formation constant) higher will be strength of ligand & more will be thermodynamic stability of complex produced.

13. (A)

Sol. Ionization isomers are those isomers in which ionisable part is different but molecular formula is same

$[CO(NH_3)_5Br]SO_4$ & $[CO(NH_3)_5SO_4]Br$

14. (D)

Sol. Trans-molecule have plane of symmetry therefore they can't exhibit optical isomersm.

15. (B)

Sol. $[Al(C_2H_5)_3]$ σ - complex

$[Fe(C_5H_5)_2]$ π - complex

$[Zn(C_2H_5)_2]$ σ - complex

$[Ni(CO)_4]$ σ - complex

16. (C)

Sol. In $[Ni(PPh_3)_2Cl_2]$ complex PPh_3 & Cl are weak field ligand

so it does not cause pairing.

In $Ni(CO)_4$

Ni $3d^8\ 4s^2$

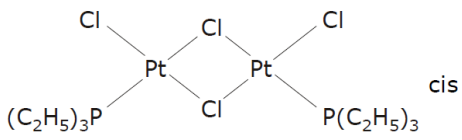
Pairing $3d^{10}$ so

↑↓ ↑↓ ↑↓ ↑↓ ↑↓ _ _ _ _

4s 4p

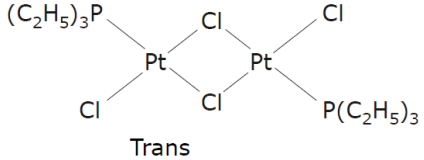
4-sp_3 hybrid orbital

17. (C)



cis

Sol.



Trans

18. (B)

Sol. $\frac{1}{\text{bond strength}} \propto \text{CO bond length} \propto \frac{e}{p}$

e- electron

p - ptoron

$\left[V(CO)_6\right]^- \frac{e}{p} = \frac{24}{28} > 1$

$\left[Cr(CO)_6\right] \frac{e}{p} = \frac{24}{24} = 1$

$\left[Mn(CO)_6\right]^+ \frac{e}{p} = \frac{24}{25} < 1$

19. (D)

Sol. NO is three electron donating ligand 6 × 2 for CO = 4 × 3 for NO

= total 12 electron for donation

20. (C)

Sol. $NiCl_2[P(C_2H_5)_2(C_6H_5)]_2$

Ni^{2+}

Paramagnetic tetrahedral — Diamagnetic square planar

21. 1

Sol. Oxidation state of Fe in this complex is + 1.

$[Fe(H_2O)_5NO]SO_4$ (NO is present as NO^+)

x + 5(0) + 1 = + 2

x + 1 = 2, x = 2 – 1

x = 1

22. 6

Sol. Coordination number of cobalt in $[Co(en)_2Br_2]Cl_2$ is 6.

23. 3

Sol. $H_x[CO(CO)_4]$

x + y + 0 = 0

y = – x

EAN →

27 – (–x)+ 4 × 2 = 36

27 + x + 8 = 36

x = 36 – 35

x = 1

$\left[fe(CO)_X.(\overset{+4}{\Pi} - C_5H_5)\right]^+$

$\Pi - C_5H_6 \rightarrow 6\ e^-$ donar

26 – (+2) + 2x + 6 = 36

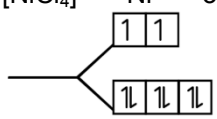
24 + 2x + 6 = 36

2x = 6

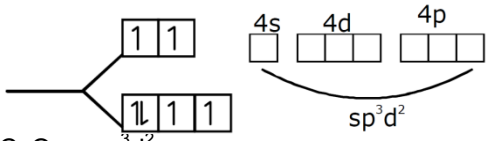
x = 3

24. 3

Sol. $[NiCl_4]^{2-} = Ni^{2+} = 3d^8 4s^0$



$Na_3[CoF_6] = 3d^6\ 4s^0$



$CsO_2 = sp^3d^2$

$Cs^+.O_2 –$ = superoxised as per M.I.

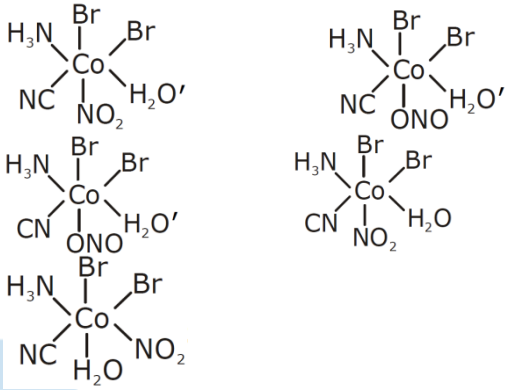
25. 9

Sol. [M(AA).a_4]

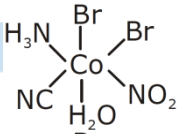
does not show optical isomerism

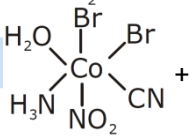
26. 4

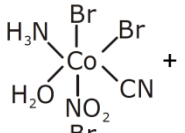
Sol. X is 28.NO_2 and CN are ambidentate ligands with N,O and C,N as donor sites

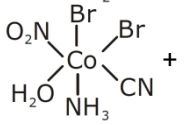


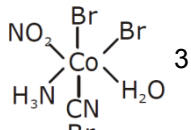
Similarly this will have three more isomers with different donor atoms of NO_2 & CN

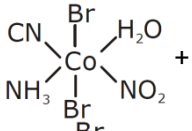
 + 3 more isomers

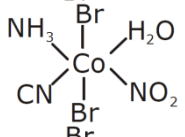
 + 3 more isomers

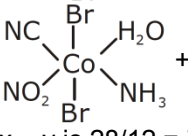
 + 3 more isomers

 + 3 more isomers

 3 more isomers Y is 12

 + 3 more isomers

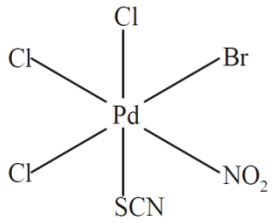
 + 3 more isomers

 + 3 more isomers

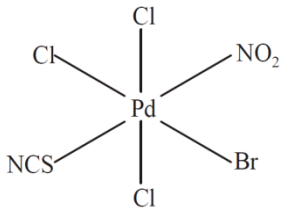
x ÷ y is 28/12 = 7/3

27. 4

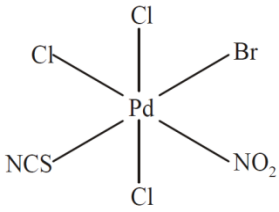
Sol.



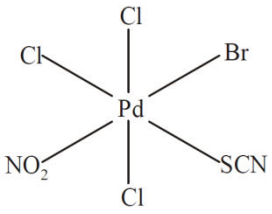
Cis



trans



trans



trans

28. 4

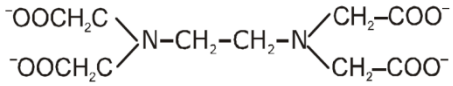
Sol. $[Cr(NH_3)_6]Cl_3 \longrightarrow [Cr(NH_3)_6]^{3+} + 3Cl^-$

One complex cation + 3 simple anion

Total = 4

29. 1

Sol.



EDTA is hexadented ligand, one EDTA required

30. 3

Sol. (I) Facial with respect to Cl

(II) Meridional with respect to Cl

(III) Meridional with respect to OH^- & NH_3