

# Inorganic Chemistry Questions

Total number of molecules/species from following which will be paramagnetic is \_

## Inorganic Chemistry Questions

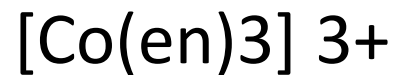
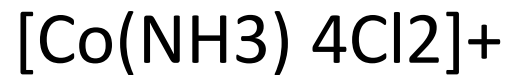
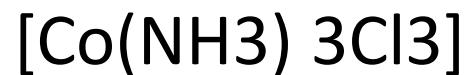
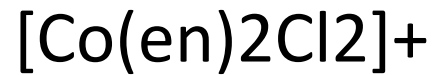
The spin-only magnetic moment value of  $M^{n+}$  ion formed among Ni, Zn, Mn and Cu that has the least enthalpy of atomisation is complexes among  $K_2[NiCl_4]$ ,  $[Zn(H_2O)_6]Cl_2$ ,  $K_3[Mn(CN)_6]$  and  $[Cu(PPh_3)_3]I$ . (in nearest integer)  
Here n is equal to the number of diamagnetic

## Inorganic Chemistry Questions

The number of paramagnetic metal complex species among  $[\text{Co}(\text{NH}_3)_6]^{3+}$ ,  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$ ,  $[\text{MnCl}_6]^{3-}$ ,  $[\text{Mn}(\text{CN})_6]^{3-}$ ,  $[\text{CoF}_6]^{3-}$ ,  $[\text{Fe}(\text{CN})_6]^{3-}$  and  $[\text{FeF}_6]^{3-}$  with same number of unpaired electrons is

# Inorganic Chemistry Questions

The complex that shows Facial - Meridional isomerism is :



## Inorganic Chemistry Questions

One mole of the octahedral complex compound  $\text{Co}(\text{NH}_3)_5\text{Cl}_3$  gives 3 moles of ions on dissolution in water. One mole of the same complex reacts with excess of  $\text{AgNO}_3$  solution to yield two moles of  $\text{AgCl}(\text{s})$ . The structure of the complex is:

## Inorganic Chemistry Questions

The number of unpaired electrons responsible for the paramagnetic nature of the following complex species are respectively :  $[\text{Fe}(\text{CN})_6]^{3-}$ ,  $[\text{FeF}_6]^{3-}$ ,  $[\text{CoF}_6]^{3-}$ ,  $[\text{Mn}(\text{CN})_6]^{3-}$

## Inorganic Chemistry Questions

The homoleptic and octahedral complex of  $\text{Co}^{2+}$  and  $\text{H}_2\text{O}$  has unpaired electrons(s) in the  $t_{2g}$  set of orbitals.

## Inorganic Chemistry Questions

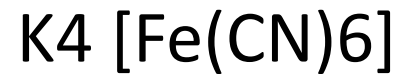
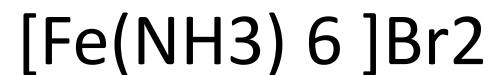
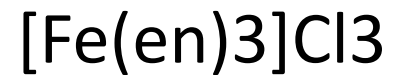
The theory that can completely\properly explain the nature of bonding in  $[\text{Ni}(\text{CO})_4]$  is:

- A. Werner's theory
- B. Molecular orbital theory
- C. Crystal field theory
- D. Valence bond theory



# Inorganic Chemistry Questions

In which of the following complexes the CFSE,  $\Delta_{\text{o}}$  will be equal to zero?



## Inorganic Chemistry Questions

The correct order of the following complexes in terms of their crystal field stabilization energies is :

Options:

- A.  $[\text{Co}(\text{NH}_3)_4]^{2+} < [\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Co}(\text{en})_3]^{3+}$
- B.  $[\text{Co}(\text{NH}_3)_4]^{2+} < [\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Co}(\text{en})_3]^{3+} < [\text{Co}(\text{NH}_3)_6]^{3+}$
- C.  $[\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Co}(\text{NH}_3)_4]^{2+} < [\text{Co}(\text{en})_3]^{3+}$
- D.  $[\text{Co}(\text{en})_3]^{3+} < [\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Co}(\text{NH}_3)_4]^{2+}$

## Inorganic Chemistry Questions

The correct increasing order of stability of the complexes based on Del0 value is :

I.  $[\text{Mn}(\text{CN})_6]^{3-}$  II.  $[\text{Co}(\text{CN})_6]^{4-}$  III.  $[\text{Fe}(\text{CN})_6]^{4-}$  IV.  $[\text{Fe}(\text{CN})_6]^{3-}$

## Inorganic Chemistry Questions

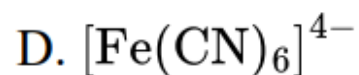
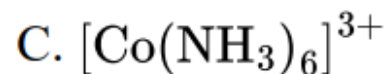
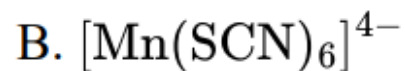
The d-orbital electronic configuration of the complex among  $[\text{Co(en)}_3]^{3+}$ ,  $[\text{CoF}_6]^{3-}$ ,  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$  and  $[\text{Zn}(\text{H}_2\text{O})_6]^{2+}$  that has the highest CFSE is :

# Inorganic Chemistry Questions

**Which one of the following complexes will have  $\Delta_o = 0$  and  $\mu = 5.96$  B.M?**

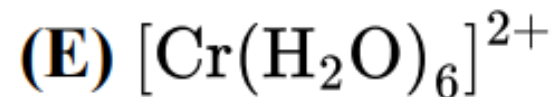
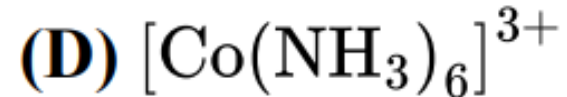
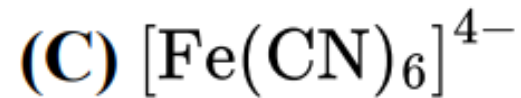
**JEE Main 2025 (Online) 4th April Morning Shift**

**Options:**



# Inorganic Chemistry Questions

**Identify the homoleptic complex(es) that is/are low spin.**



## Inorganic Chemistry Questions

The number of optical isomers exhibited by the iron complex obtained from the following reaction is



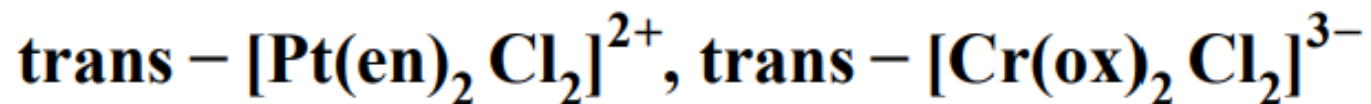
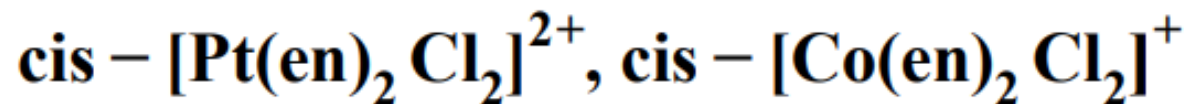
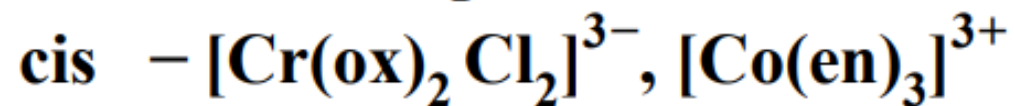
## Inorganic Chemistry Questions

Number of stereoisomers possible for the complexes,  $[\text{CrCl}_3(\text{py})_3]$  and  $[\text{Cr}(\text{ox})_2]^{3-}$  are respectively (py = pyridine, ox = oxalate )



# Inorganic Chemistry Questions

**Number of complexes which show optical isomerism among the following is**

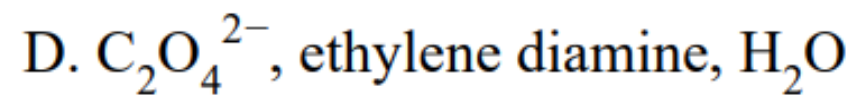
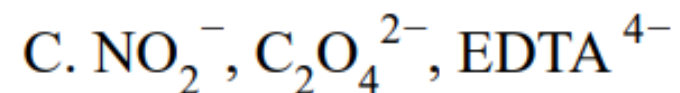
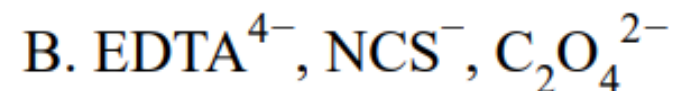
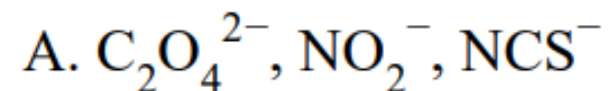


**[30-Jan-2024 Shift 2]**

# Inorganic Chemistry Questions

**The set which does not have ambidentate ligand (s) is  
[11-Apr-2023 shift 1]**

**Options:**



# Inorganic Chemistry Questions

**From the magnetic behaviour of  $[\text{NiCl}_4]^{2-}$  (paramagnetic) and  $[\text{Ni}(\text{CO})_4]$  (diamagnetic), correct geometry and oxidation state.**

**JEE Main 2025 (Online) 22nd January Morning Shift**

**Options:**

- A.  $[\text{NiCl}_4]^{2-}$  : Ni(0), tetrahedral  $[\text{Ni}(\text{CO})_4]$  : Ni(0), square planar
- B.  $[\text{NiCl}_4]^{2-}$  :  $\text{Ni}^{\text{II}}$ , tetrahedral  $[\text{Ni}(\text{CO})_4]$  : Ni(0), tetrahedral
- C.  $[\text{NiCl}_4]^{2-}$  :  $\text{Ni}^{\text{II}}$ , tetrahedral  $[\text{Ni}(\text{CO})_4]$  :  $\text{Ni}^{\text{II}}$ , square planar
- D.  $[\text{NiCl}_4]^{2-}$  :  $\text{Ni}^{\text{II}}$ , square planar  $[\text{Ni}(\text{CO})_4]$  : Ni(0), square planar

# Inorganic Chemistry Questions

|                                       |                 |
|---------------------------------------|-----------------|
| (A) $[\text{CoF}_6]^{3-}$             | (I) $d^2sp^3$   |
| (B) $[\text{NiCl}_4]^{2-}$            | (II) $sp^3$     |
| (C) $[\text{Co}(\text{NH}_3)_6]^{3+}$ | (III) $sp^3d^2$ |
| (D) $[\text{Ni}(\text{CN})_4]^{2-}$   | (IV) $dsp^2$    |

# Inorganic Chemistry Questions

**The type of hybridization and the magnetic property of  $[\text{MnCl}_6]^{3-}$  are,**

**JEE Main 2025 (Online) 2nd April Evening Shift**

**Options:**

- A.  $sp^3d^2$ , paramagnetic with four unpaired electrons.
- B.  $d^2sp^3$ , paramagnetic with four unpaired electrons.
- C.  $sp^3d^2$ , paramagnetic with two unpaired electrons.
- D.  $d^2sp^3$ , paramagnetic with two unpaired electrons.

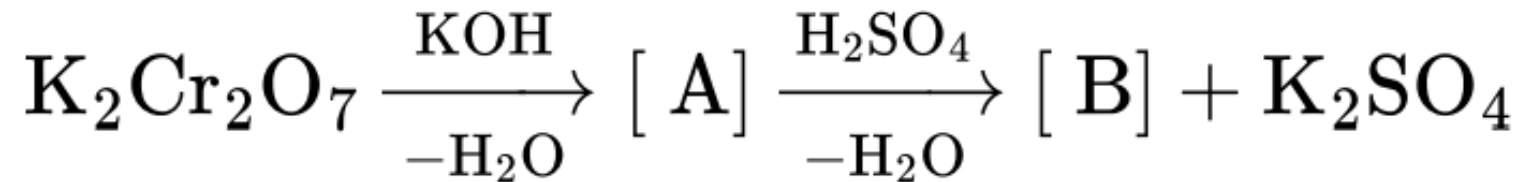
# Inorganic Chemistry Questions

The number of species from the following that are involved in  $sp^3d^2$  hybridization is

$[\text{Co}(\text{NH}_3)_6]^{3+}$ ,  $\text{SF}_6$ ,  $[\text{CrF}_6]^{3-}$ ,  $[\text{CoF}_6]^{3-}$ ,  $[\text{Mn}(\text{CN})_6]^{3-}$ , and  $[\text{MnCl}_6]^{3-}$

# Inorganic Chemistry Questions

**Consider the following reactions**



**The products [A] and [B], respectively are :**

## Inorganic Chemistry Questions

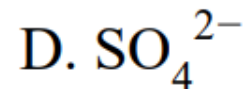
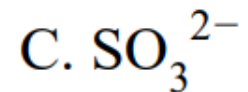
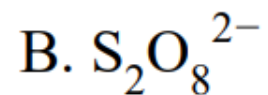
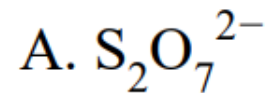
Potassium dichromate acts as a strong oxidizing agent in acidic solution. During this process, the oxidation state changes from



# Inorganic Chemistry Questions

**In neutral or alkaline solution,  $\text{MnO}_4^-$  oxidises thiosulphate to :**  
**[27-Jul-2022-Shift-2]**

**Options:**



# Inorganic Chemistry Questions

**Lanthanoid ions with  $4f^7$  configuration are :**



# Inorganic Chemistry Questions

**The pair of lanthanides in which both elements have high third - ionization energy is:**

**[13-Apr-2023 shift 1]**

**Options:**

A. Dy, Gd

B. Eu, Gd

C. Lu, Yb

D. Eu, Yb

## Inorganic Chemistry Questions

Which of the following pair is not isoelectronic species?  
(At. no. Sm, 62; Er, 68; Yb, 70; Lu, 71; Eu, 63; Tb, 65; Tm, 69)[28-Jul-2022-Shift-2]

Options:

- A.  $\text{Sm}^{2+}$  and  $\text{Er}^{3+}$
- B.  $\text{Yb}^{2+}$  and  $\text{Lu}^{3+}$
- C.  $\text{Eu}^{2+}$  and  $\text{Tb}^{4+}$
- D.  $\text{Tb}^{2+}$  and  $\text{Tm}^{4+}$

## Inorganic Chemistry Questions

The correct order of atomic radii is :

[Jan. 12, 2019 (II)]

Options:

- A.  $N > Ce > Eu > Ho$
- B.  $Ho > N > Eu > Ce$
- C.  $Ce > Eu > Ho > N$
- D.  $Eu > Ce > Ho > N$

# Inorganic Chemistry Questions

**$\text{CrCl}_3 \cdot x\text{NH}_3$  can exist as a complex. 0.1 molal aqueous solution of this complex shows a depression in freezing point of  $0.558^\circ\text{C}$ . Assuming 100% ionisation of this complex and coordination number of Cr is 6, the complex will be (Given  $K_f = 1.86 \text{ K kg mol}^{-1}$ )**

**JEE Main 2025 (Online) 23rd January Morning Shift**

**Options:**

- A.  $[\text{Cr}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$
- B.  $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$
- C.  $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$
- D.  $[\text{Cr}(\text{NH}_3)_3\text{Cl}_3]$

# Inorganic Chemistry Questions

|  |            |
|--|------------|
| (A) $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$     | (I) 3, 6   |
| (B) $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$ | (II) 3, 4  |
| (C) $\text{Hg} [\text{Co}(\text{SCN})_4]$              | (III) 2, 6 |
| (D) $[\text{Mg} (\text{EDTA})]^{2-}$                   | (IV) 2, 4  |

## Inorganic Chemistry Questions

'X' is the number of electrons in  $t_{2g}$  orbitals of the most stable complex ion among  $[\text{Fe}(\text{NH}_3)_6]^{3+}$ ,  $[\text{FeCl}_6]^{3-}$ ,  $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$  and  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ . The nature of oxide of vanadium of the type  $\text{V}_2\text{O}_x$  is :



# Inorganic Chemistry Questions

**Choose the correct statements about the hydrides of group 15 elements.**

**A. The stability of the hydrides decreases in the order  
 $\text{NH}_3 > \text{PH}_3 > \text{AsH}_3 > \text{SbH}_3 > \text{BiH}_3$**

**B. The reducing ability of the hydrides increases in the order  
 $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3 < \text{BiH}_3$**

**C. Among the hydrides,  $\text{NH}_3$  is strong reducing agent while  $\text{BiH}_3$  is mild reducing agent.**

**D. The basicity of the hydrides increases in the order  
 $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3 < \text{BiH}_3$**

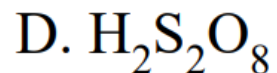
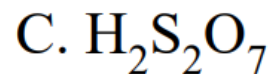
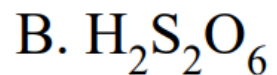
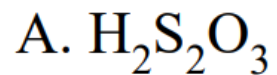
**Choose the most appropriate from the option given below:**

# Inorganic Chemistry Questions

**Which of the following oxoacids of sulphur contains "S" in two different oxidation states?**

**[28-Jun-2022-Shift-2]**

**Options:**



## Inorganic Chemistry Questions

Arrange the following species in order of increasing ionic radii and explain the trend:  $\text{Al}^{3+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Na}^{+}$ ,  $\text{F}^{-}$ ,  $\text{O}^{2-}$ ,  $\text{N}^{3-}$

## Inorganic Chemistry Questions

Arrange the following elements in order of increasing first ionization enthalpy and explain ALL anomalies: Li, Be, B, C, N, O, F

## Inorganic Chemistry Questions

Arrange F, Cl, Br, I in order of electron gain enthalpy (most negative to least negative)

## Inorganic Chemistry Questions

An element has successive ionization energies (kJ/mol):  $IE_1 = 800$ ,  $IE_2 = 2427$ ,  $IE_3 = 3658$ ,  $IE_4 = 25024$ ,  $IE_5 = 32824$

Determine:

- (a) Number of valence electrons
- (b) Group number
- (c) Explain the large jump

## Inorganic Chemistry Questions

Identify the INCORRECT electronegativity order:



## Inorganic Chemistry Questions

Arrange  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{P}_2\text{O}_3$ ,  $\text{SO}_2$  in order of increasing acidic strength



## Inorganic Chemistry Questions

Identify the INCORRECT trend in atomic radii:

- (a)  $\text{Si} > \text{P} > \text{Cl} > \text{F}$
- (b)  $\text{Mg} > \text{Al} > \text{C} > \text{O}$
- (c)  $\text{Al} > \text{B} > \text{N} > \text{F}$
- (d)  $\text{Be} > \text{Mg} > \text{Al} > \text{Si}$

## Inorganic Chemistry Questions

An element E has electronic configuration  $[\text{Rn}] 5f^{14} 6d^1 7s^2$

- (a) Determine its atomic number
- (b) Name the element (IUPAC nomenclature)
- (c) Identify its block, group, and period
- (d) What type of element is it?